ELECTRICAL REVIEW

FRIDAY
ECEMBER 1958

WEEKLY
PRICE 1s 6d

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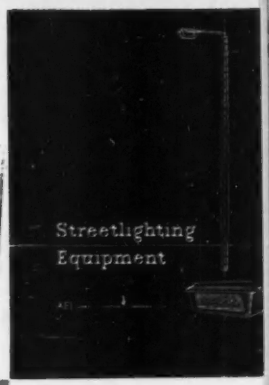
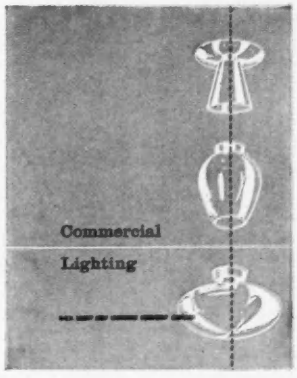
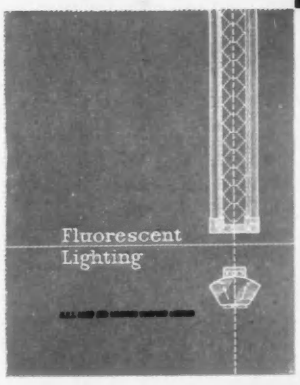
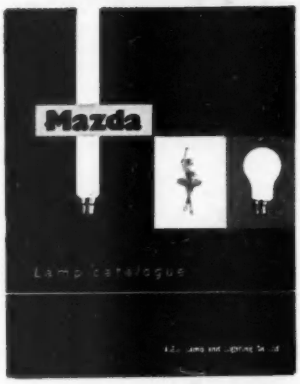
DETROIT

If you buy lighting







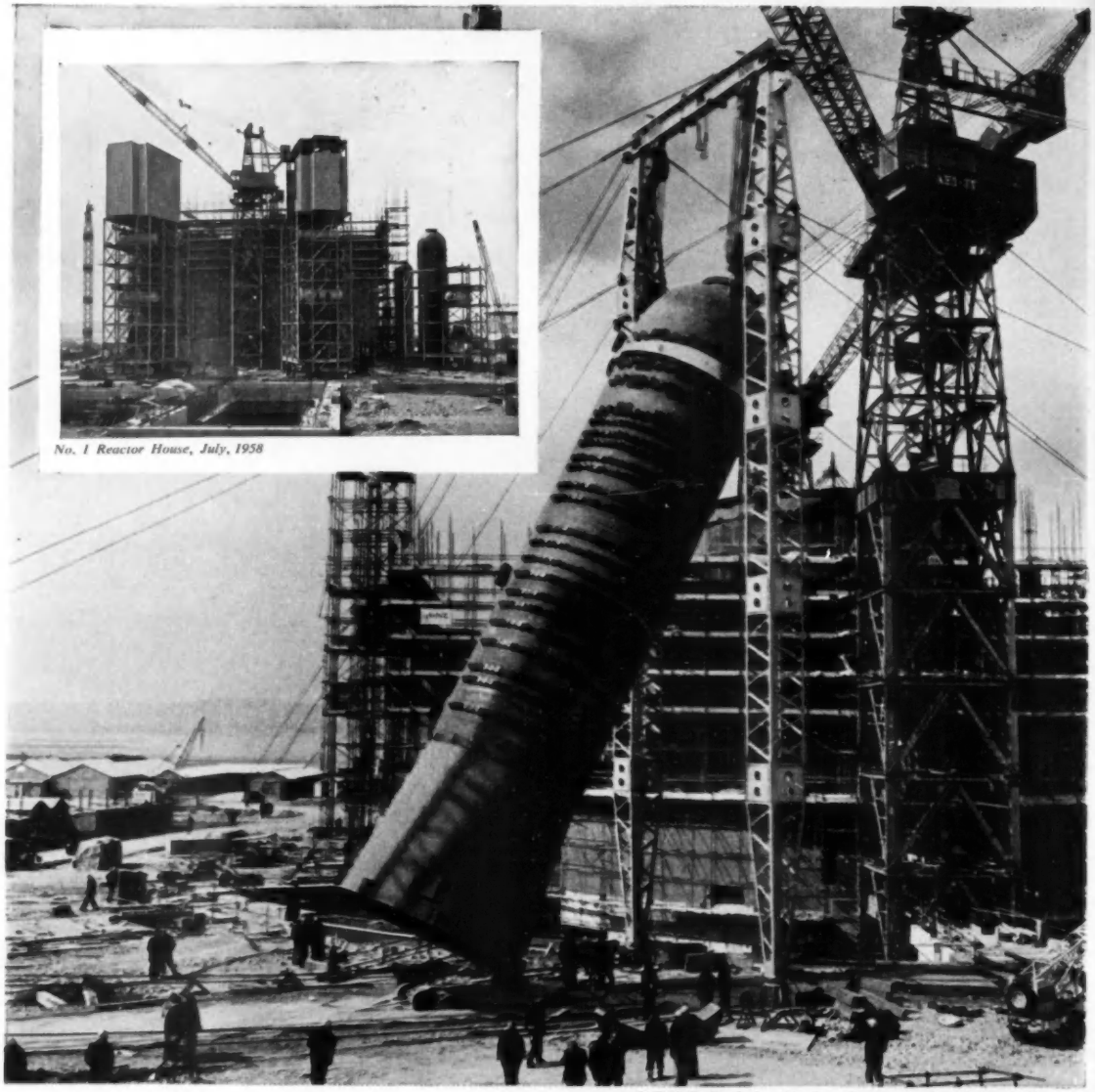


You need these catalogues

A·E·I
Lamp and Lighting Co Ltd

Publicity Department, 18 Bedford Square, London, W.C.1

H4748



No. 1 Reactor House, July, 1958

C.E.G.B. Berkeley Nuclear Power Station, being built by A.E.I.-John Thompson Nuclear Energy Company Ltd.

HEAT EXCHANGERS, BERKELEY

The sixteen large heat exchanger (or 'boiler') vessels for Berkeley Nuclear Power Station are now being erected on site by John Thompson.

The vessels, 70 ft. long, 17 ft. 6 in. in diameter and weighing 133 tons, are transported on two bogies from the Berkeley site boiler shop, where fabrication is completed, to their positions adjoining the reactor houses.

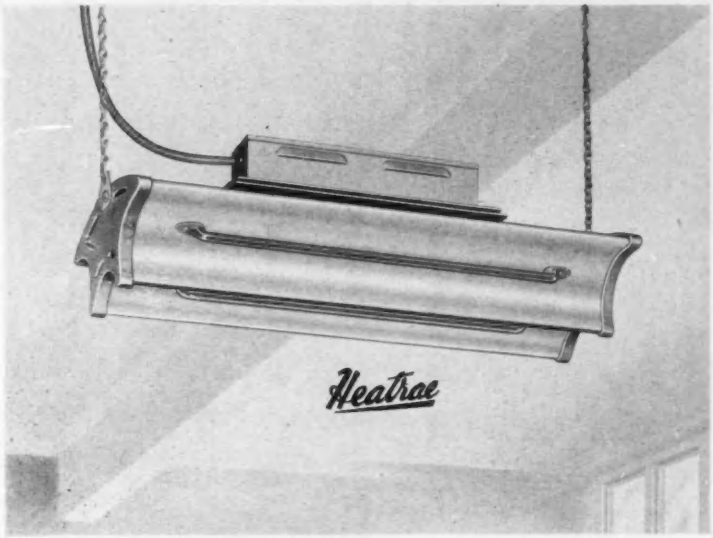
JOHN THOMPSON GROUP

Manufacture and installation of these heat-exchanger vessels by John Thompson is so arranged to eliminate the transportation of excessive loads from the works at Wolverhampton and yet to reduce to a minimum the amount of work to be done on site. This is achieved by manufacture of the vessel in sections at the home works and then welding-up the sections to form complete vessels in a site boiler shop specially erected at Berkeley. The site boiler shop accommodates four vessels at a time.

JOHN THOMPSON LIMITED · WOLVERHAMPTON · ENGLAND

WTA/19a

Heatrae of Norwich



THE HEATRAE MULTIROD — A high level overhead Radiant Heater for Industrial and Commercial use.

SPECIAL FEATURES: Safety long life metal sheathed elements. Rustless anodised aluminium reflectors. No exposed live parts.

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Pioneers since 1920 in all-electric water heaters

NORWICH – ENGLAND

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Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Flameproof Heating Apparatus, Food Trolleys, Warming Plates, Air Heaters. Specialists in Steam Heated Oil Heaters and Calorifizers for Shipboard.

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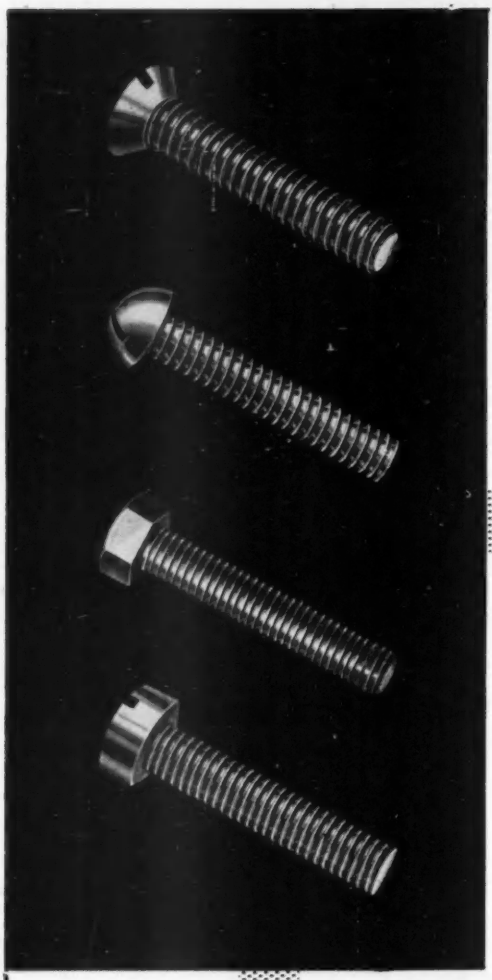


Rolled Thread Screws

TAKE no chances about your supplies of Rolled Thread Screws—specify ORMOND and so make sure of both quality *and* quantity—delivered right on time and straight from our extensive stocks. Send for lists, which also detail Cut Thread Screws, immediately available. For your individual requirements we will gladly submit special quotations.

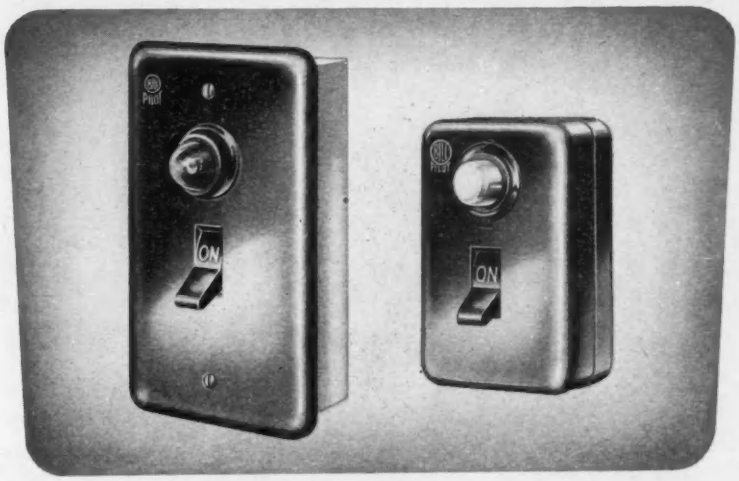
ENGINEERING ORMOND COMPANY LTD.

THE ORMOND ENGINEERING CO. LTD., Ormond House, Rosebery Avenue, London, E.C.1

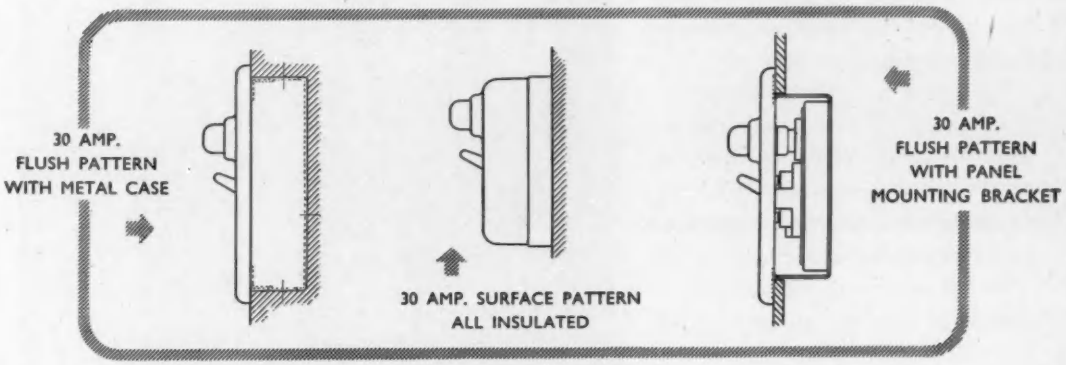
Telephone : TERminus 2888 *Telegrams : "Ormondengi, Smith"*

You cannot buy better gear

BILL PILOT SWITCHES



- IDEAL FOR WATER HEATING INSTALLATIONS UP TO 6 K.W. LOADING WHERE ON-LOAD INDICATION IS REQUIRED
- HIGH PERFORMANCE A.C. DOUBLE-POLE, SLOW BREAK SWITCHES WITH SILVER TIPPED CONTACTS
- TERMINALS ARE POSITIONED FOR EASY WIRING WITH FULL PROVISION FOR THROUGH EARTH CONNECTION



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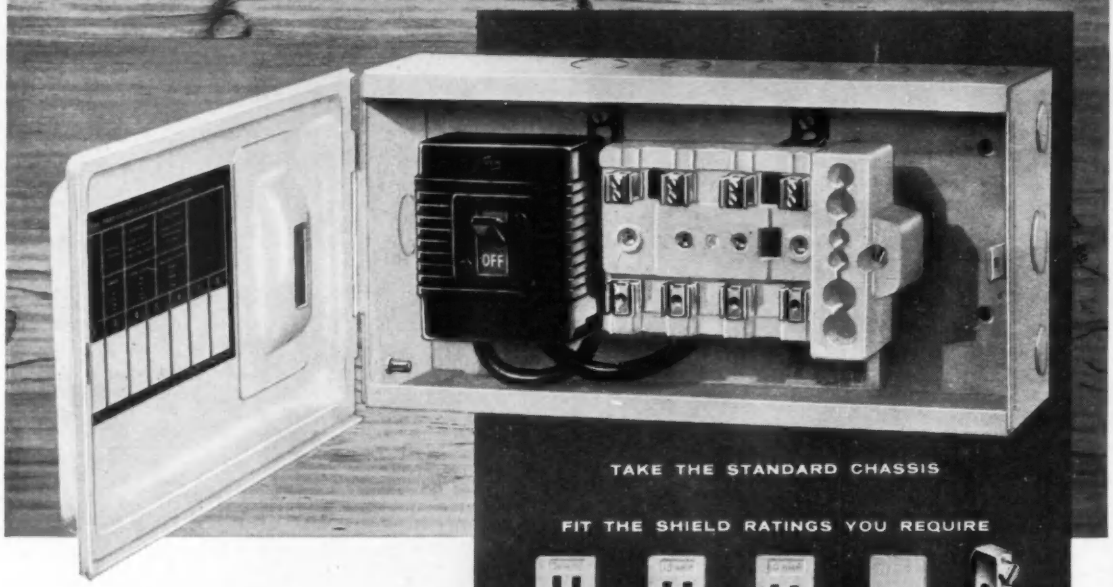
MEMERA the unit which set a new high standard in the industry



If the job calls for unusual fuse combinations, it's no trouble at all with Memera. No other equipment gives you the same versatility as Memera.

The system is so delightfully simple. The chassis is the same for all combinations. Just fit the appropriate shields to suit the fuse ratings you need for the job. Once these are fitted, only the correctly rated fuse handles can be inserted.

And of course with Memera there is the big advantage that you can use either rewirable or H.R.C. fuses.

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BRUSSELS WORLD EXHIBITION 1958
Engineering Centre, Collective Exhibit

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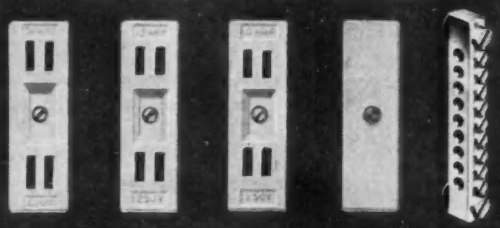
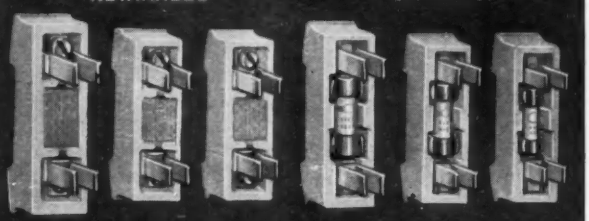
FIT THE SHIELD RATINGS YOU REQUIRE



ONLY THE RIGHT FUSE HANDLE RATINGS WILL THEN FIT

REWIRABLE OR H.R.C.



30 AMP 15 AMP 5 AMP 30 AMP 15 AMP 5 AMP

MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD. · TYSELEY · BIRMINGHAM 11

25 kW continuous output

with the

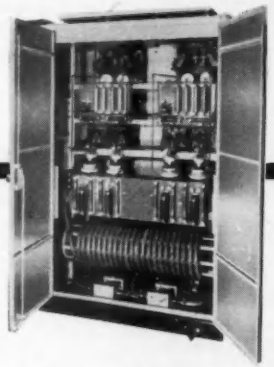
GENERAL PURPOSE INDUCTION HEATER

In numerous industrial processes, induction heating provides results that would otherwise be impracticable or unobtainable—particularly where heat-effect must be strictly localised and rigidly controlled.

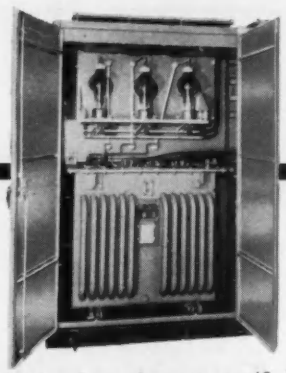
The new BTH high-frequency generator has been designed for the widest possible range of industrial applications. It is quick and economical in operation—there is no waste heat, and the effect of heat on other parts of the work is minimised. Clean, cool, and fumeless in operation, it readily lends itself to fully automatic operation in a production line.

Write for booklet DL5857-3

Type FA27A general-purpose high-frequency generator. Continuous rating: 25 kW. Peak intermittent (50% duty cycle): 30 kW. Output frequency: 400 k/cs. Supply: 3 phase, 50/60 cycles, 380/440 volt.



Oscillator valve section.



High voltage thyratron rectifier and transformer section.

BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

an A.E.I. Company

A5227

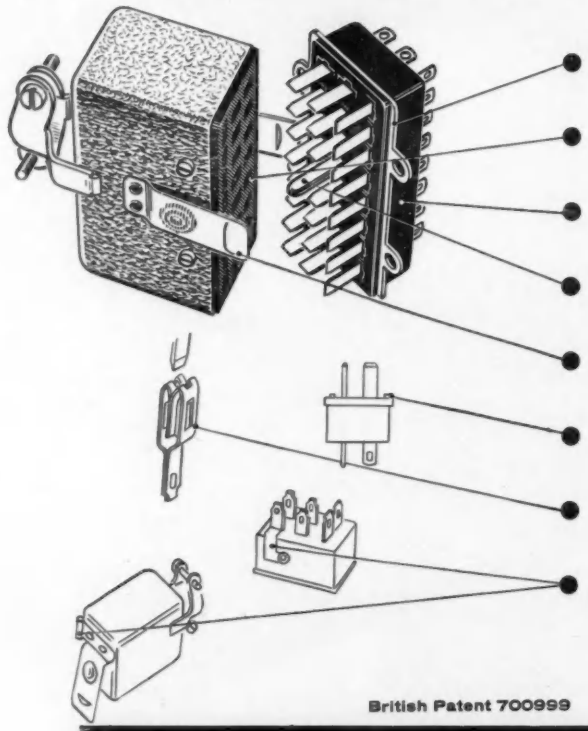
"MULTICON" PLUGS AND SOCKETS

The full range consists of 2, 4, 6, 8, 10, 12, 18, 24 and 33-pole sizes. Illustrated is the 24-pole size.

Working voltage: 1,000 volts D.C. or A.C. (peak) or 500 volts D.C. or A.C. (peak) in tropical use.

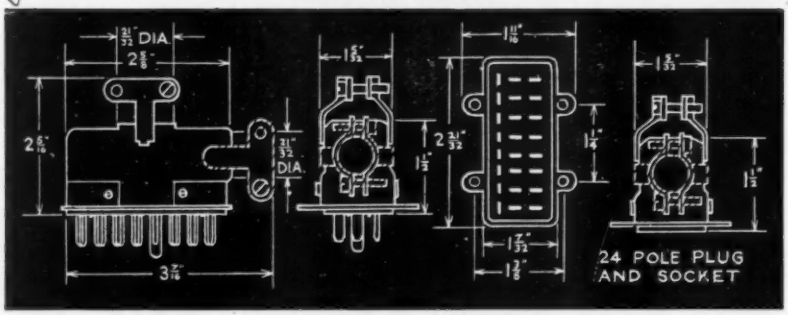
Current rating: 5 amps. D.C. or A.C. (R.M.S.) per contact.

Average contact resistance: below 0·002 ohms.



- Metal flanges moulded into the body to ensure flush mounting and to avoid alignment difficulties.
- Terminal numbering moulded into plug and socket bodies to facilitate wiring and cableform testing.
- Single-piece nylon-filled body mouldings provide high insulation and tracking resistance.
- Large pin locator contact facilitates engagement, especially in unitor applications.
- Optional vibration-proof retaining blades to secure the unit to panel or chassis.
- Four distance pips keep mating faces apart and eliminate moisture traps between plug and socket faces.
- Socket clips have split limbs with four areas in contact with each plug blade ensuring absolute reliability of contact.
- Earthing of plug or socket covers is achieved by either:
  internal connecting link from a contact to cover, OR
  rivetted earth tag to outside of cover.

British Patent 700999



Write for full catalogue from

Painton & Co. Ltd.

KINGSTHORPE NORTHAMPTON

Tel: 32354/7 Telegrams: 'Ceil, Northampton'

Don't tell me this is actually going to save money?

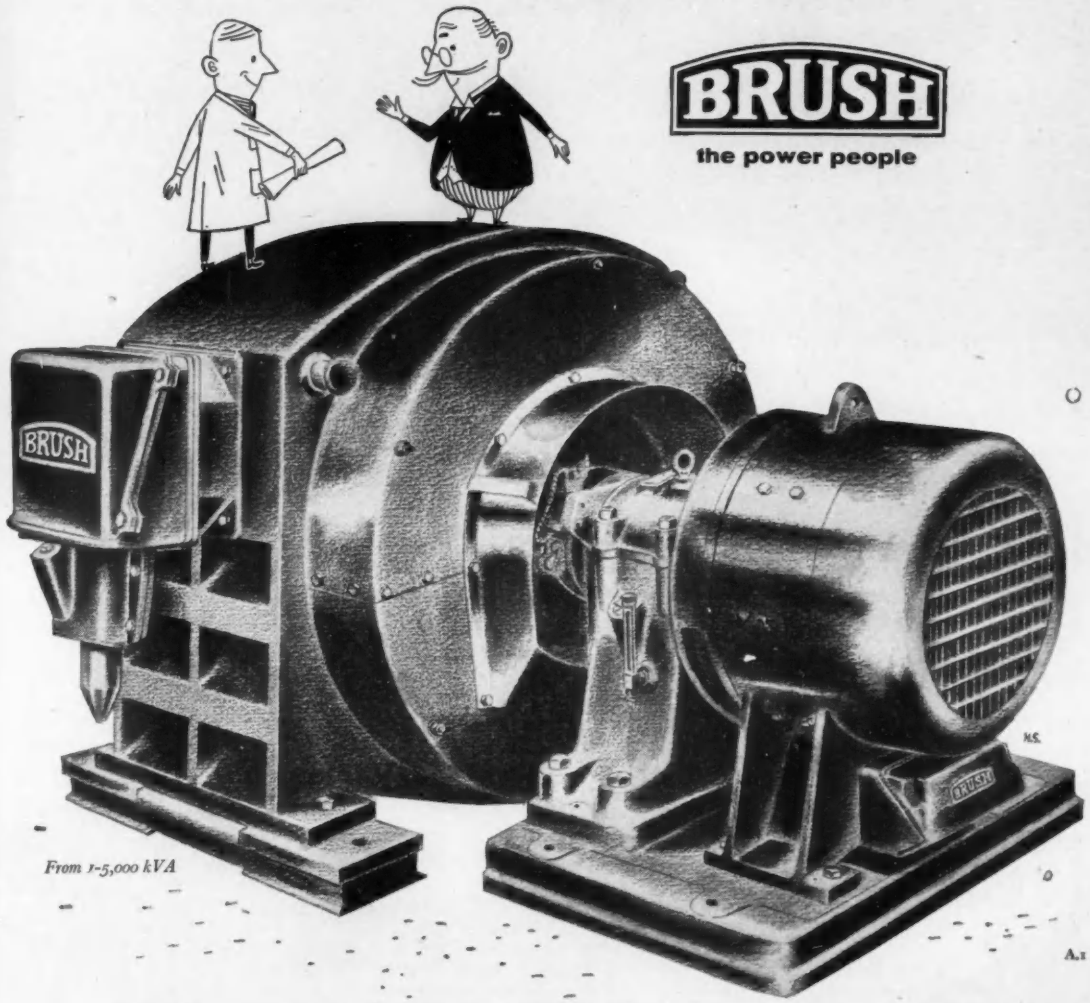
Why yes, sir. Because it's such an efficient piece of machinery.
It will produce power at the minimum cost. It will run continuously
for long periods without trouble, cut down on maintenance, save on fuel . . .

Stop ! Before you get carried away by your enthusiasm,
tell me — how do you *know* it will do all this ?
After all, one alternator is much like another, surely ?

Ah, that's the whole point, sir. This is a BRUSH *alternator.*
That makes all the difference. The Brush people are amongst the oldest hands
in the business. They really know what they're doing when
they build an alternator. Every single component is a precision engineering job.
And tip-top workmanship goes into every little detail.
Take the windings, for instance. They're impregnated with a special varnish to . . .

All right young man. That's enough. I'm prepared to concede that we chose wisely
when we decided to install an alternator by Brush.

BRUSH
the power people



From 1-5,000 kVA

A.1

Write for literature on the type of power equipment you are interested in, to :
BRUSH ELECTRICAL ENGINEERING CO LTD • LOUGHBOROUGH • ENGLAND

Member of the Hawker Siddeley Group

BY APPOINTMENT TO HER MAJESTY THE QUEEN MANUFACTURERS OF ELECTRIC LAMPS

UP..... with Crompton

AND

LIFE-LIGHT

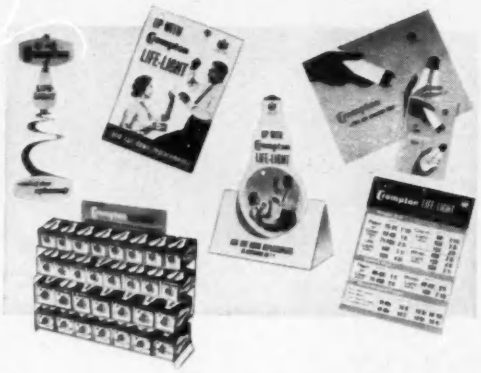
UP..... comes a new Crompton lamp with a longer life and a higher output. The name you'll be asked for is LIFE-LIGHT.

AND

UP..... go your lamp sales—under pressure of intensified television advertising in the three main areas, and with your help in displaying and making use of the selling aids supplied to you.

Help the name catch on—help yourself cash in!

Make sure you show the Life-Light display material. The space it takes up is small: its reminder-value is enormous!

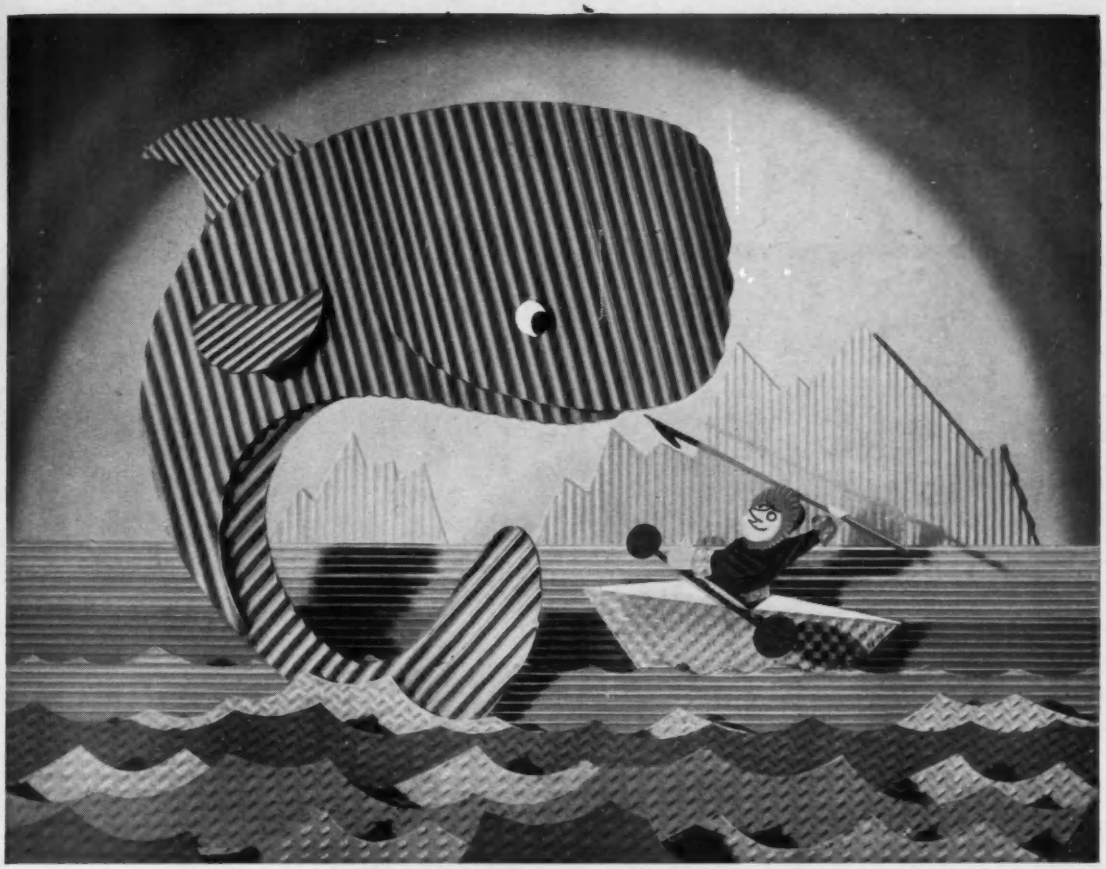


Stock up with

Crompton lamps

Now!

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2



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Reed are the pioneers of corrugated fibreboard cases. The Reed sales network covers the whole of the United Kingdom. Contact the nearest Reed Office for immediate, complete, personal service.

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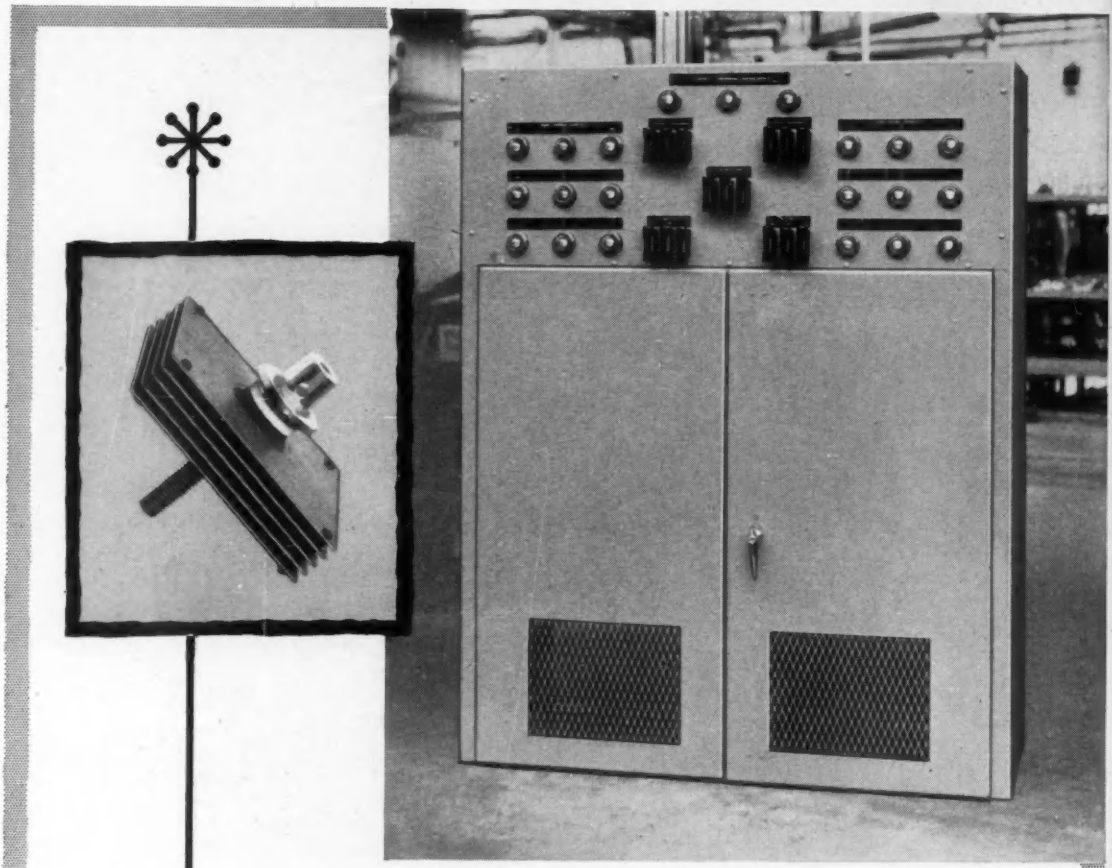


HEWITTIC GERMANIUM AND SILICON RECTIFIERS

THE above illustration shows one of a number of Hewittic germanium rectifiers employing Hewittic germanium rectifier diodes. A close up view of one of these diodes is shown alongside.

For Germanium and Silicon rectifiers specify Hewittic — the name backed by over 50 years rectifier manufacturing experience.

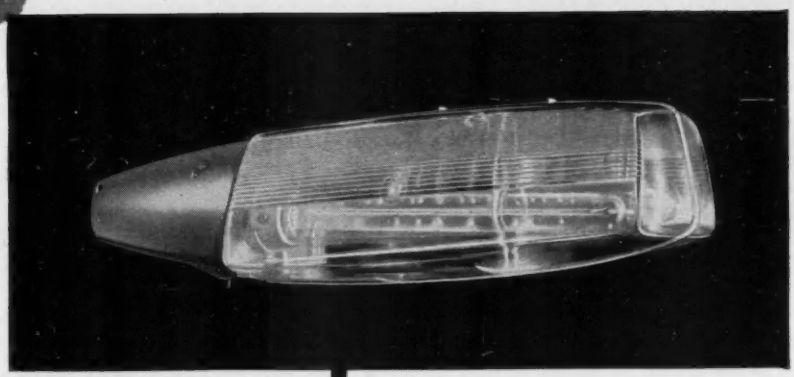
HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams & Cables: "Electric, Walton-on-Thames"*

OVERSEAS REPRESENTATIVES — **ARGENTINA** H. A. Roberts & Cia., S.R.L., Buenos Aires. **AUSTRALIA** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W., Queensland, W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BELGIUM & LUXEMBOURG** Pierre Pollie, Brussels 3. **BRAZIL** Oscar G. Mors, Sao Paulo. **BURMA** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. **CEYLON** Envee Ess Ltd., Colombo. **CHILE** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA** Gerald Hoe & Co., Nairobi. **EGYPT** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND** Sähkö-ja Koneliike O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE** Glyndova Ltd. **GREECE** Charilaos C. Coroneos, Athens. **INDIA** Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras 1. **IRAQ** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS** J. Kater E.I., Ouderkerk a.d. Amstel. **NEW ZEALAND** Richardson McCabe & Co. Ltd., Wellington, etc. **PAKISTAN** The Karachi Radio Co., Karachi 3. **SOUTH AFRICA** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO** Thomas Peake & Co., Port of Spain. **TURKEY** Dr. H. Salim öker, Ankara. **U.S.A.** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburg 30, Pennsylvania. **VENEZUELA** Oficina de Ingenieria Sociedad Anonima, Caracas.

. . . but nowadays it's 'DIAKON' for street lighting fittings

A lantern and refractor, which are injection moulded in 'Diakon' acrylic moulding powder, have the following properties:

- **Good appearance.**
- **Consistency of production.**
- **Ease of maintenance.**
- **Efficient light control.**
- **Toughness.**
- **Unchanging properties with continuous outdoor exposure.**



GROUP 'A' STREET LIGHTING. The 'Atlas' Opticell sodium lantern, manufactured by Thorn Electrical Industries Ltd., represents a new development in lantern design for Group 'A' road lighting. The interior of the lantern is sealed against ingress of dirt, insects and rain.

GROUP 'B' STREET LIGHTING. The 'Dielikon' refractor is manufactured by The Wardle Engineering Co. Ltd. for Group 'B' road lighting, and is used with metal filament or mercury vapour lamps. Very efficient light control is obtained from a sealed refractor system, and only smooth surfaces are exposed, which facilitates cleaning.

'DIAKON'

'Diakon' is the registered trade mark for the acrylic moulding powder manufactured by I.C.I.

* *Further information and technical service are available on application to the nearest I.C.I. Sales Office.*

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.I

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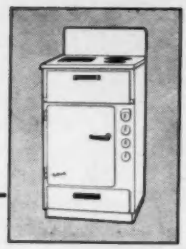

ABOUT THE 47AB

A few weeks ago in my last half yearly report, I mentioned we were always at work in our Research Department striving to introduce further improvements to our products generally. Our latest step forward is to fit our 47AB Cooker with rollers at the back so that it can easily be moved forward for general cleaning purposes. This will, of course, be included without any extra charge. We can now also fit any make of Auto Timer that may be preferred.

You, of course, all know from your own actual experience that where this cooker has been reasonably well looked after (and most housewives do take a pride in their cooker), it is almost as good after 11 years' hard wear as it was the day it was installed. We mention 11 years because, as a matter of fact, as its name implies, this 47AB Cooker was first put on the market in quantities in 1947, which is just 11 years ago.

That is why your Maintenance Department know the 47AB from A to Z and can almost deal with it blindfolded, but as you also know it seldom requires any attention at all and as all the plates conform to E.D.A. specification you have no problem with spares. As, of course, an average figure for service calls and replacements has to be allowed for in your hire purchase charges, this feature of low maintenance cost is of the greatest importance, in fact, it probably means that you make more profit out of a 47AB in the long run, than any other cooker.

Absolute reliability is the most important feature any woman wants in a cooker, electric or otherwise, and this is where the 47AB excels. Eleven years of production and cooking experience with well over half a million cookers has enabled us, with your help, to embody practical improvements in its construction almost every year, resulting in the very reliable and popular cooker you all know so well. Fortunately, our present-day sales are vastly bigger than ever before, so that we are now obtaining almost the full benefit of the increased plant and enamelling facilities we recently installed.

If, therefore, you want a good cooker for long term hire purchase —5/7/10 or even 20 years or more, then YOU JUST CAN'T BEAT A BELLING 47AB, and what is more we can give you very good delivery!

Here's wishing you all a very Merry Christmas and a very Prosperous New Year to follow.

C. A. Belling

Belling & Co. Ltd., Enfield, Middlesex. HOWard 1212

Electrical Review
12 Dec. 1958

Luveline

not just another lighting fitting

but something **NEW!**

in lighting technique

Here is a lighting fitting which will do everything.

It is made of three basic parts with a diffuser which is **the largest single polystyrene injection moulding ever made for a lighting fitting.**

Developed in Canada, it is now manufactured here by Harris & Sheldon (Electrical) Ltd.

SOME OUTSTANDING LUVELINE FEATURES

- ✳ **Can be used as separate fittings or in continuous lines.**
- ✳ **Ceiling-mounting or suspension is equally simple.**
- ✳ **Installation is easy and quick.**
- ✳ **Relamping and cleaning is simplicity itself, owing to the specially hinged diffuser sections.**
- ✳ **Surface brightness is low, but efficiency is high.**

HANDSLITE

THE BEST OF BOTH WORLDS

Harris & Sheldon (Electrical) Limited

Write for illustrated folder to
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RYDER STREET BIRMINGHAM 4 Telephone CENTRAL 0272

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L.T. OIL IMMERSED SWITCHGEAR
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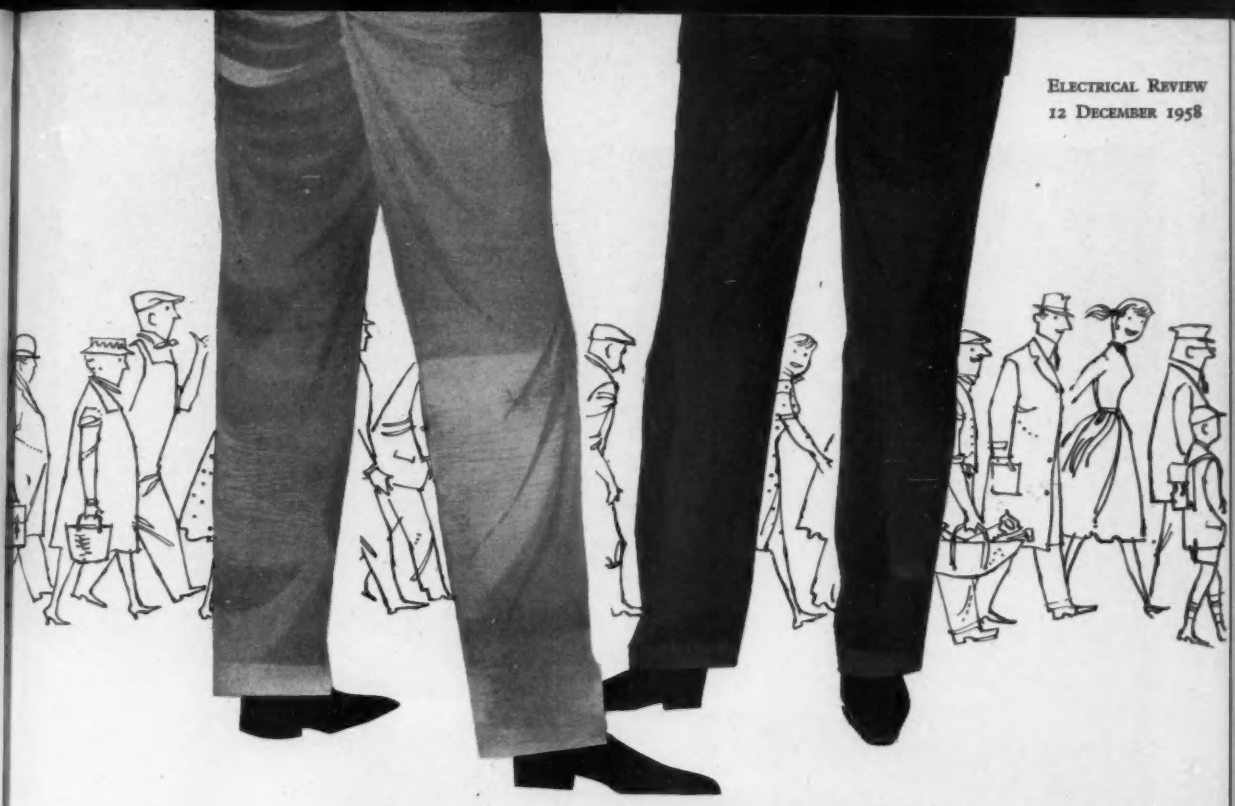
SWITCHBOARDS
CUSTOM BUILT COMPOSITE GEAR

AUTOMATIC MOTOR CONTROL GEAR



"How many people realise it?"

"Realise that this company of yours makes more insulated wires and strips than anyone else in the world."

"Realise what?"

"It's hard to say. After all it's not the kind of thing you rush out and tell everyone. It's just a case of simple fact; we produce more insulated wires and strips than anyone else and all under one roof."

"You mean you produce the whole range of insulated wires here at Leyton?"

"Yes, and the range is pretty extensive too, — in fact, any type of insulation to meet any need in the electrical industry today."

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WIRESMITHS TO THE ELECTRICAL WORLD

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

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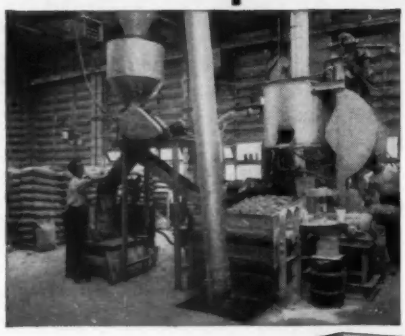
120 HOURS A WEEK Non-stop!



BKS

We specialize in the design and manufacture of automatic sequence control panels and have supplied them to practically every industry.

This control Panel has been designed and built for the sequence control of synthetic resin coated sand processing. The machine operates 5 days a week—day and night—non-stop producing 1½ tons of coated sand every hour. After loading the hoists the Panel automatically controls all process operations including discharge into the sacks. The Floor Mounted Controller incorporates H.R.C. fuses and heavy duty automatic starters for all motors which total 100 horse power. Mounted on the Panel are 6 visible continuously adjustable dial process timers with tamper proof operation counter giving full automatic control of the coating operations with manual control for sampling. This method of automatic control definitely reduces production costs. Scrap caused by incorrect mixing by hand is entirely eliminated and uniformity in batch production constantly maintained.

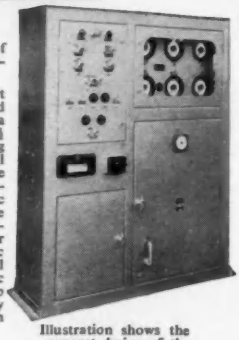


Illustration shows the compact design of the B.K.S. Panel.

May we receive your enquiries—We are confident that our suggestions will save you time and product cost.

SPECIALISTS IN ELECTRICAL CONTROL

Send for our catalogue illustrating special panels and complete range of Standard Motor Control equipment.

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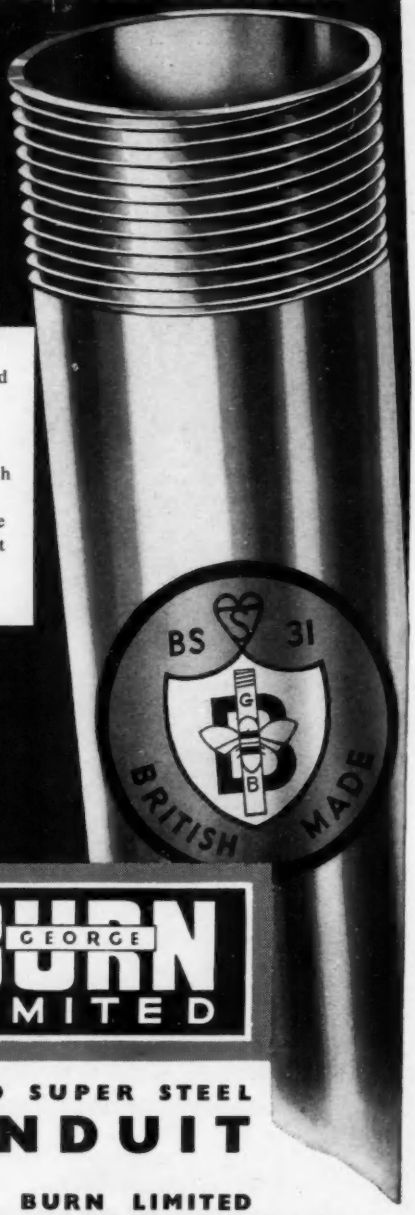

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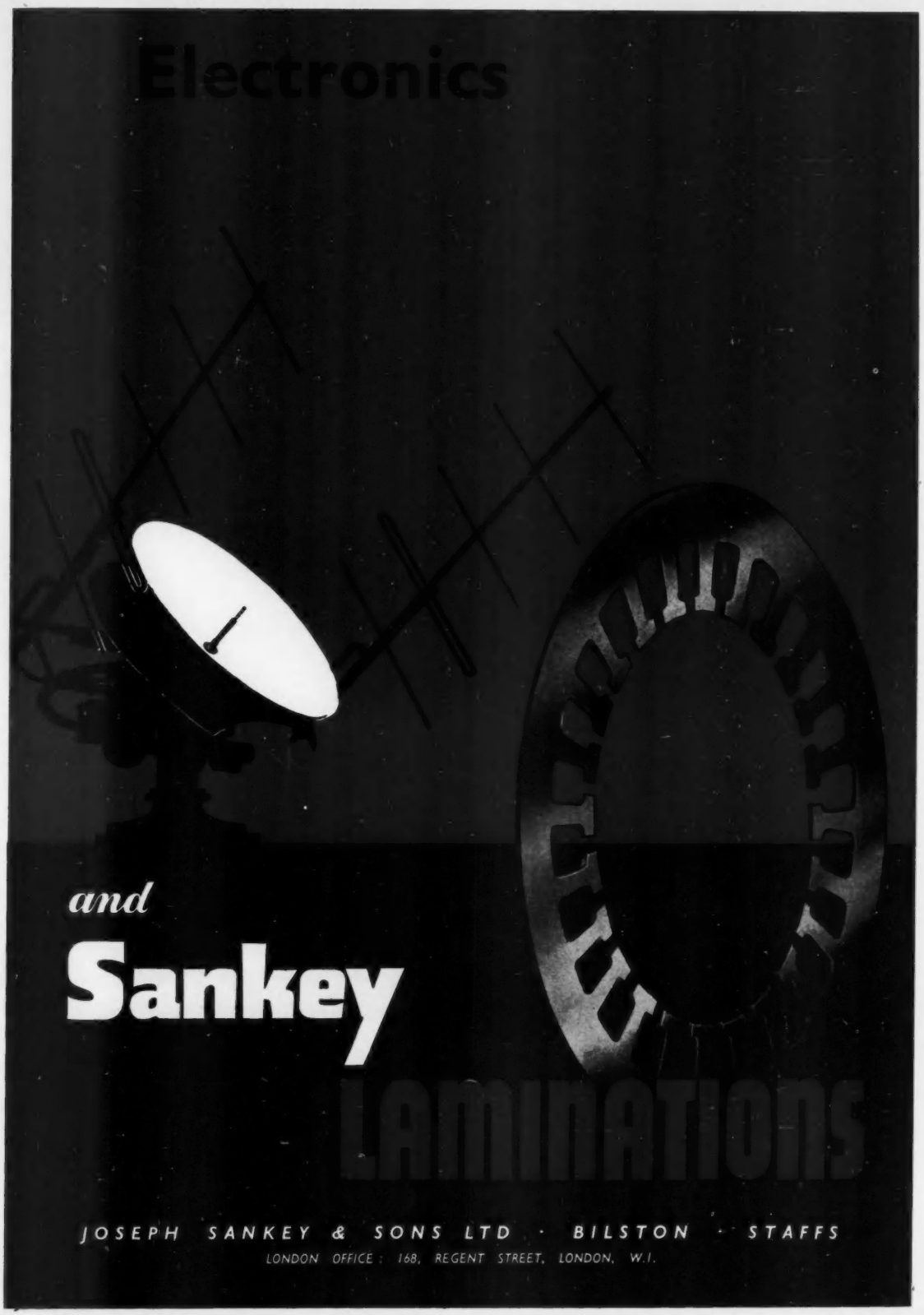
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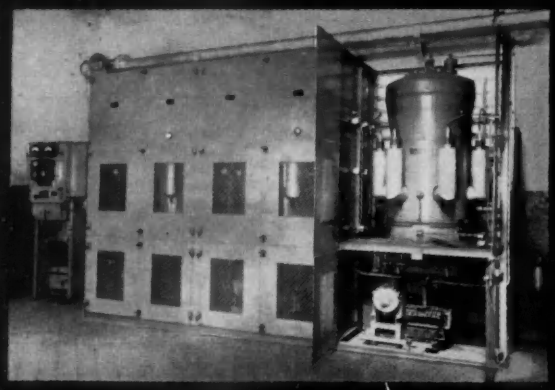
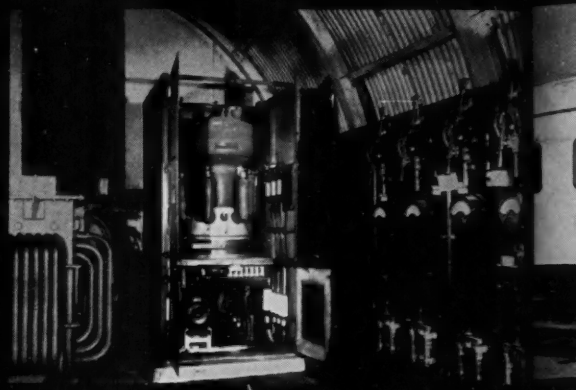
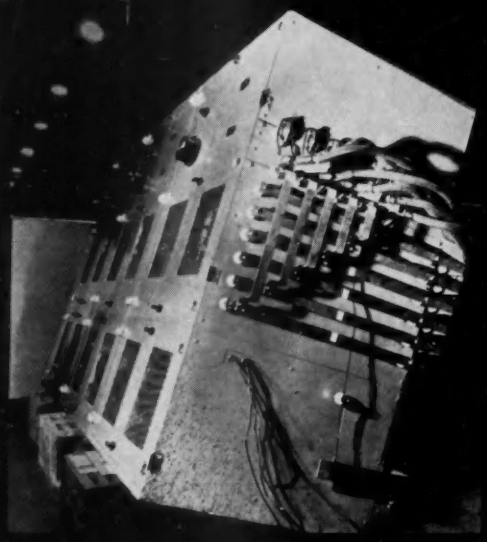


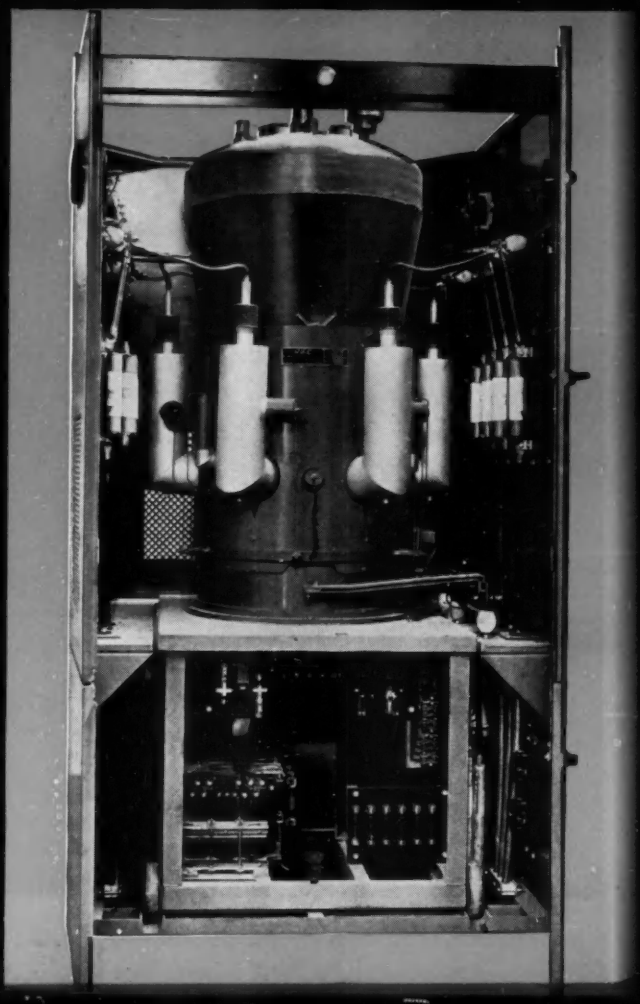


600 kW, 230/240 V, 3-cylinder pumpless air-cooled steel tank rectifier installation at a British steelworks.

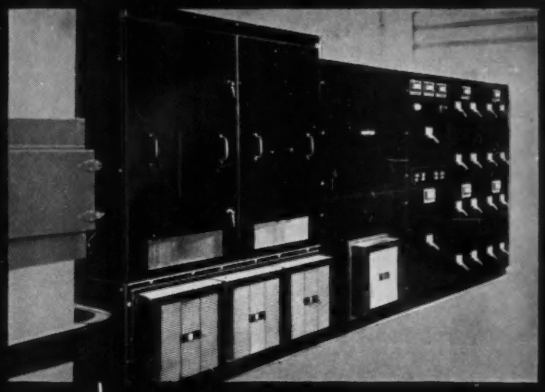
10000

300 kW at 530 V rectifier in Western Australia. The first of its kind installed underground (300 ft. below) in Australasia.





A 400 kW, 225V, G.E.C. grid-controlled pumpless air-cooled steel tank rectifier equipment undergoing "inclining test". This equipment formed part of a comprehensive contract for a large floating dock for the Admiralty, for which the G.E.C. acted as main machinery contractor. The rectifiers have to function perfectly under the conditions illustrated.



1224 kW mobile rectifier and substation specially designed for service with the Netherlands Railways.

Single anode air-cooled steel tank, grid controlled rectifiers, controlling 220 kW driving equipment for high-speed printing press in Capetown.

kW

pioneers and world leaders in this field

It was less than thirty years ago that G.E.C. pioneered the first water-cooled rectifier of wholly British design. Only five years later G.E.C. produced the world's first pumpless air-cooled steel tank unit.

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Some operate on a six month continuous full load duty cycle, others intermittently. But wherever they serve, they can be depended upon for that consistent reliability for which G.E.C. rectifiers are renowned.

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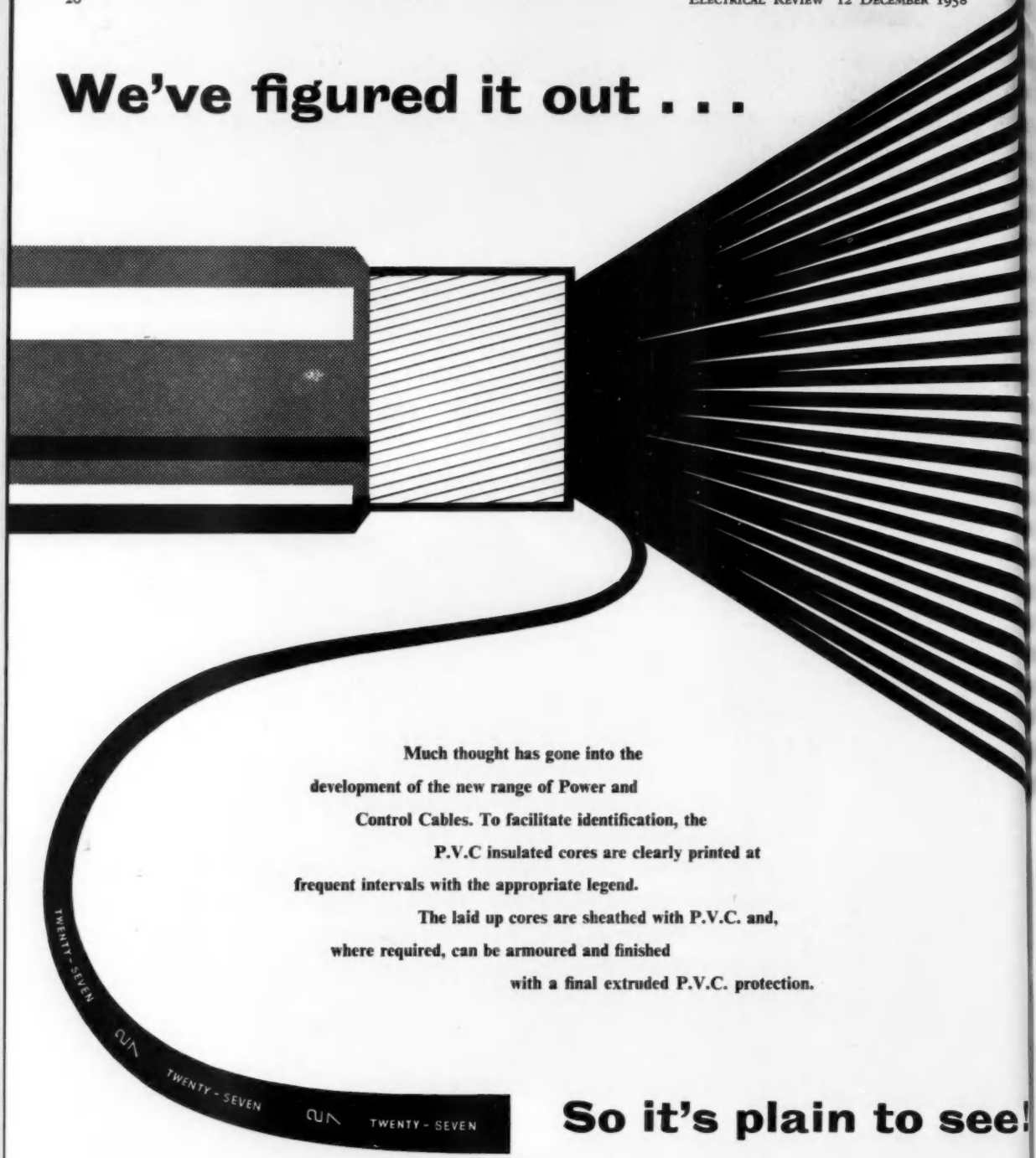
THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND

We've figured it out . . .



Much thought has gone into the development of the new range of Power and Control Cables. To facilitate identification, the P.V.C insulated cores are clearly printed at frequent intervals with the appropriate legend. The laid up cores are sheathed with P.V.C. and, where required, can be armoured and finished with a final extruded P.V.C. protection.

So it's plain to see!

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. . . provides for all cables to be accommodated in one duct with adequate screening between telephone and power cables.

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Greenwood Airvac Conduits Ltd

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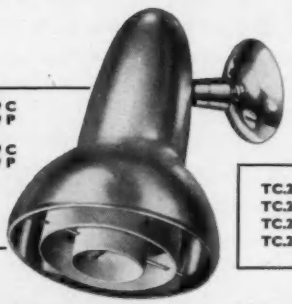
Available in a range of pastel shades, white and polished aluminium.

TC.2009 C
TC.2009 P
TC.1809 C
TC.1809 P

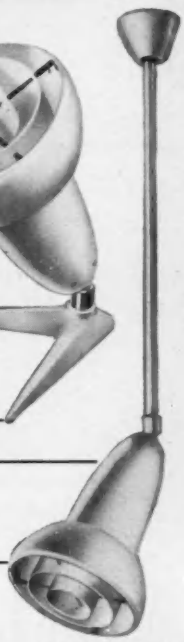
Designed for ceiling or wall mounting.



PRICES FROM 26/9

TC.2005 C
TC.2005 CS
TC.2005 P
TC.2005 PS

Reflector mounted on cast base by means of a ball joint.



TC.2029 C
TC.2029 CS
TC.2029 P
TC.2029 PS

Pendant type unit has overall drop of 33 ins.

All these units are packed 6 per carton with the pendant downrods packed separately.

Smithlite

Available direct from the manufacturer, write for literature detailing the complete range and prices:

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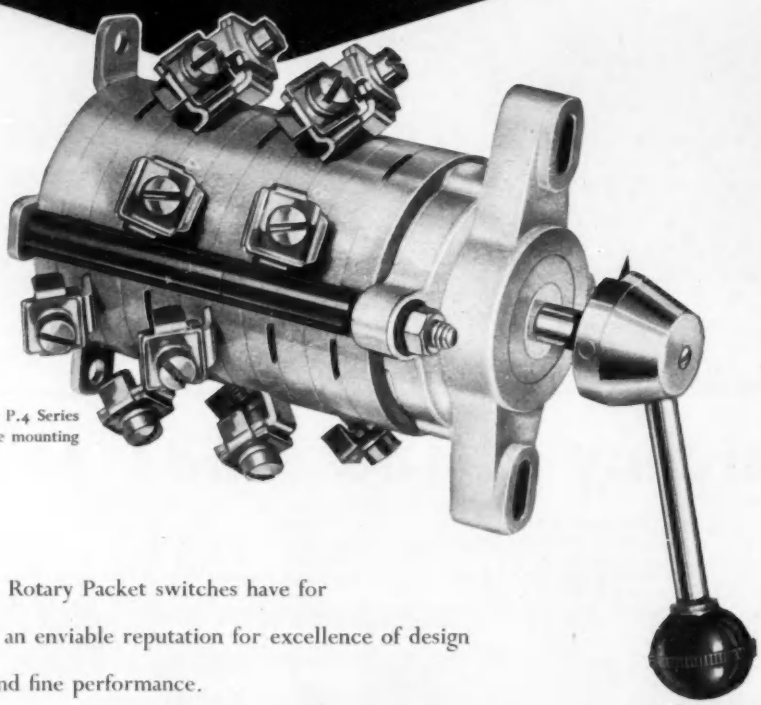
H-W.77

MULTI-CIRCUIT ROTARY PACKET SWITCHES



The illustration shows our P.4 Series arranged for panel and base mounting with machine type handle.

ARROW Rotary Packet switches have for many years enjoyed an enviable reputation for excellence of design and fine performance.

Considerable saving in cost can be effected by the simultaneous switching of various circuits using ARROW Rotary switches.

Write TODAY for a copy of LIST R.P.2 describing our P.4 Series illustrated here.

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Maximum Non-Reactive Ratings
30/35 Amps 250 v AC/DC
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ARROW

ARROW ELECTRIC SWITCHES LTD

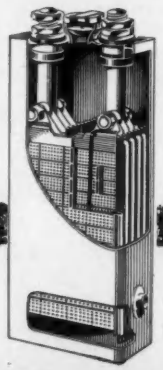
HANGER LANE · LONDON W.5

A25

WHAT'S NEW ABOUT NIFE SWITCH TRIPPING UNITS?

The design is, for a start. The fascia panel, with its flush-fitting rectangular meters, is particularly clean and uncluttered. The inclusion of a high-rate charge indicating light is without precedent. Inspection of batteries has been simplified by putting them in *one* tier. The useful space at the bottom of the cabinet is just the place for tools. Finally, the cost is new. No, it isn't more but *less* than that of the former model. Now—

What's old about Nife Switch Tripping Units? Their reliability! Like the previous 12,500 models which are in service throughout the world, these new units are steelclad, self-contained and powered by the Nife steel battery. The battery that's free from self-discharge; the battery that won't corrode. The battery, in short, that *never* lets you down.



The Nife Switch Tripping Unit can be used, in addition, for any other application involving intermittent discharges. You'd like to know more about it?

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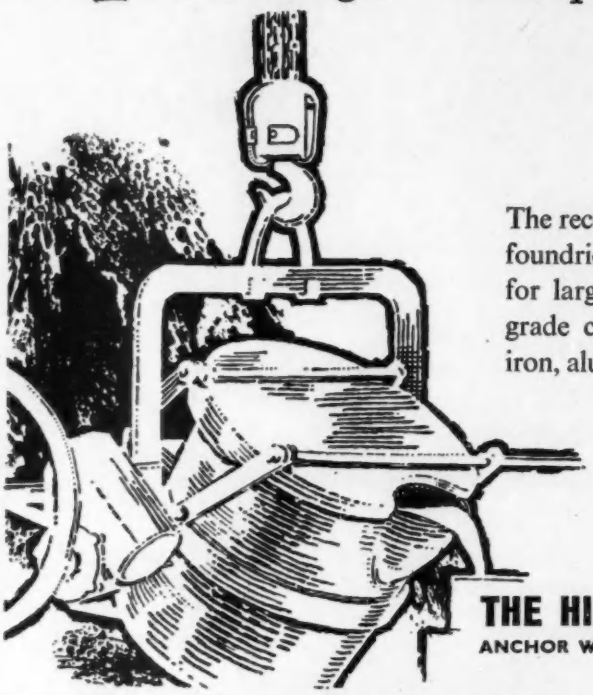
NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

N127

For castings —— specify HILLTOP



The recent extensions to the Wednesbury foundries enable Hilltop to accept orders for large and small quantities of high-grade castings in grey iron, malleable iron, aluminium alloy, and yellow metals.

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ANCHOR WORKS, SMITH ROAD, WEDNESBURY, STAFFS.
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Fluorescent Control Gear UTILAIR

All types 20/80 watt, single and twin available from stock

Unquestionably the best for
PERFORMANCE
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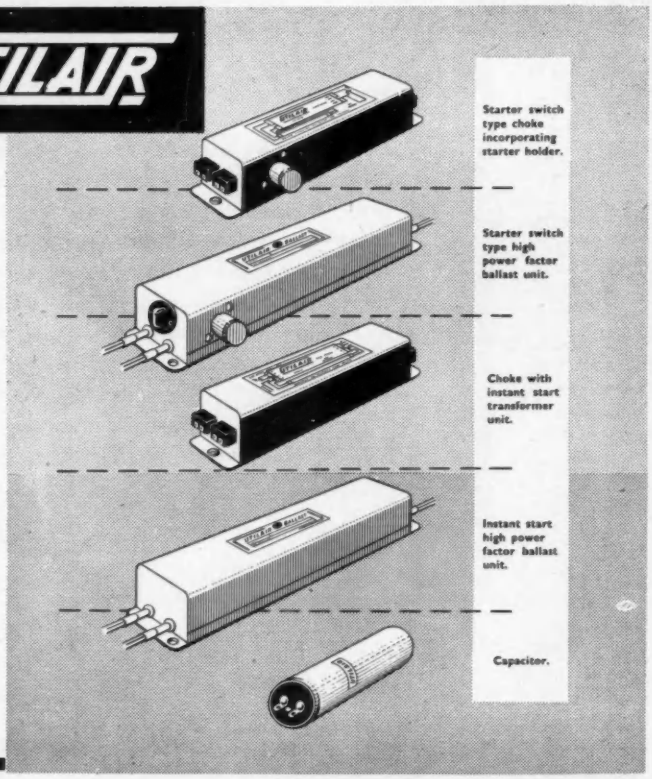
Starter switch type choke incorporating starter holder.
Starter switch type high power factor ballast unit.
Choke with instant start transformer unit.
Instant start high power factor ballast unit.
Capacitor.

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(LONDON) LIMITED
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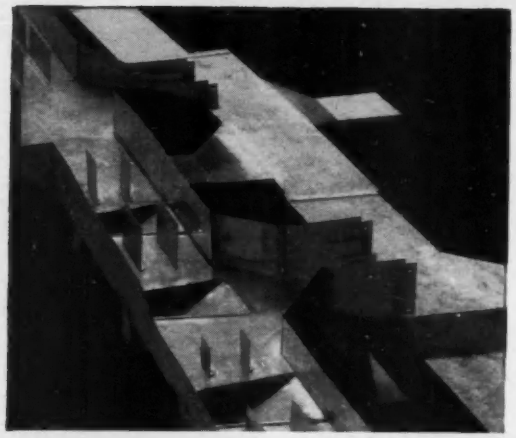
4½ miles of **BRABY** *Perforated Mild Steel Cable Trays and Supports supplied to* **Messrs. Pye Limited, Cambridge,** *for the* **Spadeadam Project, Carlisle,** *to the instructions of the main contractor, British Oxygen Wimpey Ltd, for the Chief Engineer, Ministry of Works.*



We also supplied the cable trunking for the control rooms at this important site.
The photographs are views of parts of the trays, supports and trunking erected at our Works prior to dispatch.

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PRODUCTS

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(don't send up your blood pressure),

your office equipment, telephones,

tabulators, typewriters,

(perhaps the typists too . . . bless 'em).

but . . .

to control electricity

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The mark of superiority in Switch and Fusegear.

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FALCON ELECTRICAL WORKS,
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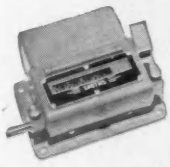
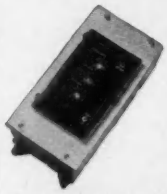
A.T.H.6..0-10,000 r.p.m.
A.T.H.7..0-20,000 r.p.m.
A.T.H.10..0-5,000 r.p.m.



Predetermined Counters for counting pre-set quantities.



Transistor Batch Counters for high speed counting of repetitive quantities.

Electric Tachometers a.c., d.c. & Three Phase.

'Petro-flex" Flexible Tubing, high and low pressure types.

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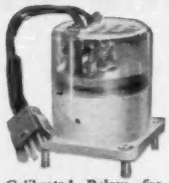

Calibrated Relays for the control of voltage, current and speed to ± 1% accuracy.

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Provide an accurate method of making spot checks of:-

ROTATIONAL SPEEDS—Shafts, spindles, gears, rotors and rolls.

LINEAR SPEEDS (ft/min or metres/min)—Metal strips, textiles, paper, wire, plastic film and conveyed material.

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Readings can be taken in bad light or where the dial is visually obscured by using the extension shaft supplied.

Write for individual leaflets

SMITHS INDUSTRIAL INSTRUMENT DIVISION

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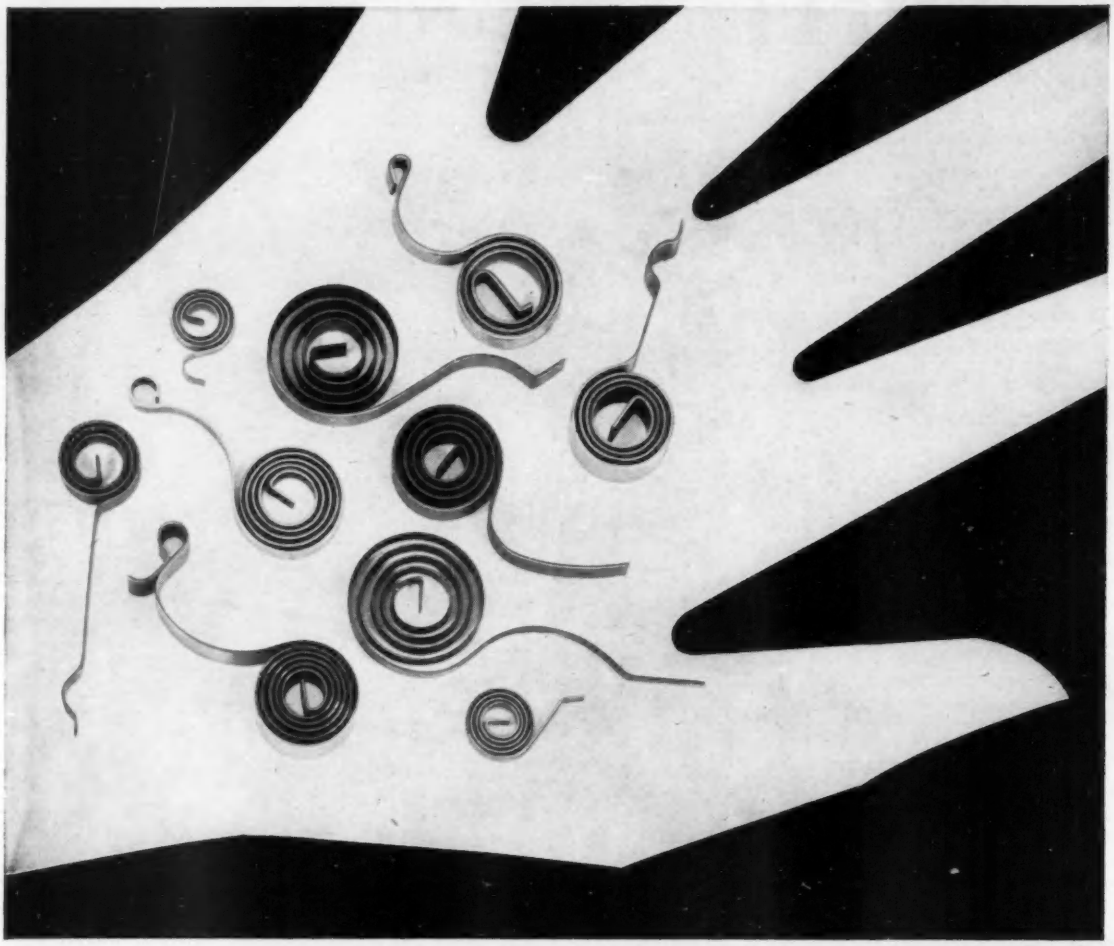
AP 168/370



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and wood blocks • sunk switch boxes • instrument cases

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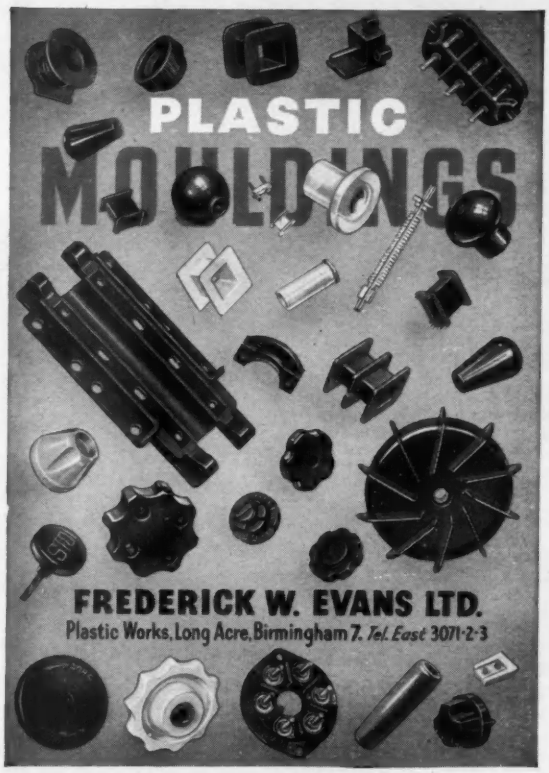

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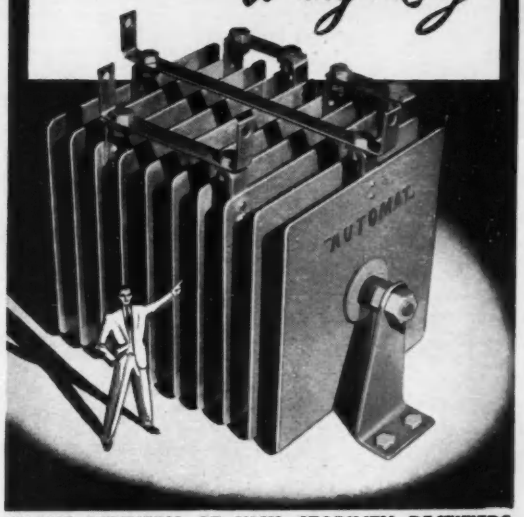

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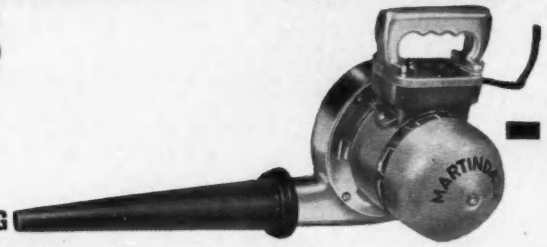
The NEW MARTINDALE Portable BLOWERS



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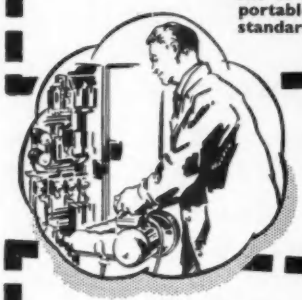
The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

EFFICIENT SUCTION

All of the five blowers are instantly converted into portable industrial suction cleaners by the use of standard attachments at little cost.



HOT AIR DRYING

An independent Heater is available for attachment to the Blowers, which produces hot air for the quick drying of coils, transformers and for many other purposes.

THE "PORT-A-VAC" (regd.)

The "Port-A-Vac" (regd.) light-weight harness permits the Martindale Blower to be used as a powerful vacuum cleaner carried in comfort upon the operator's back leaving him free to climb ladders, etc., to clean out-of-reach parts of the factory.

"MARTINET" WET-DRY SUCTION PICK UP

With this amazing equipment any Martindale Blower is converted into a suction cleaner which picks up both *liquids* and *solids*, the liquids and dirt being deposited into the special tank and only the airborne dust into the filter bag.

For full details of Specifications of Martindale Maintenance Equipment write to:—

MARTINDALE ELECTRIC CO. LIMITED

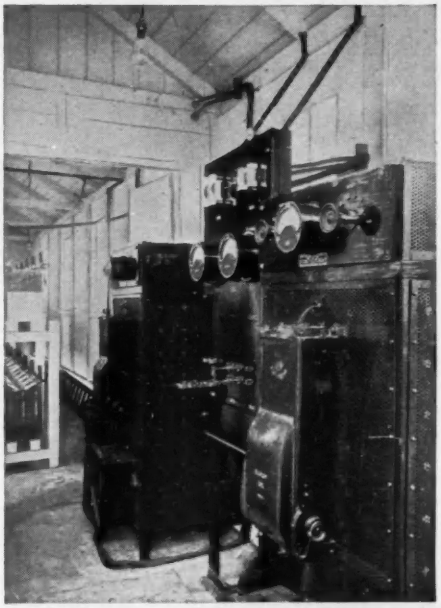
4 Westmorland Rd., London, N.W.9. COLindale 8642 also at 25 Elmbank St. GLASGOW C.2.

M.G.Y.

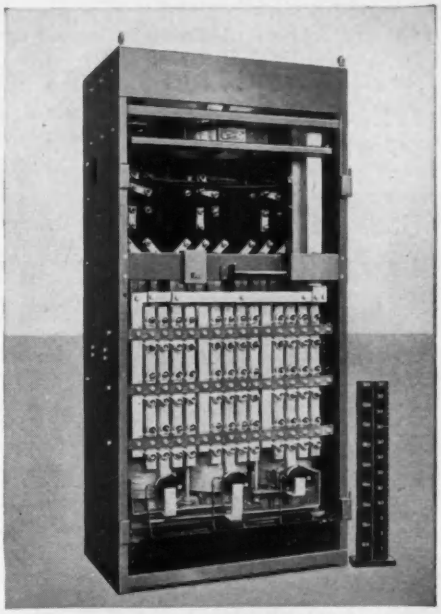
WESTINGHOUSE

EXPERIENCE

is your Guarantee for all Rectifier problems

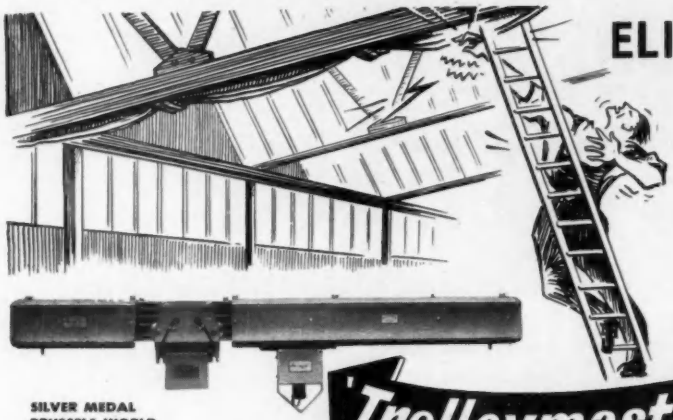


1930 *A 1kW copper-oxide rectifier charging batteries of a railway signalling installation.*



1958 *A Westinghouse 250kW silicon rectifier/transformer for industrial d.c. power supplies.*

WESTINGHOUSE BRAKE AND SIGNAL CO. LTD., 82 YORK WAY, KING'S CROSS, LONDON, N.1
Telephone: TERminus 6432



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FOR SAFER MOBILE ELECTRIC POWER SUPPLIES USE THE..

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BRUSSELS WORLD
EXHIBITION 1958
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'Trolleymaster' ENCLOSED COLLECTOR TRACK SYSTEM

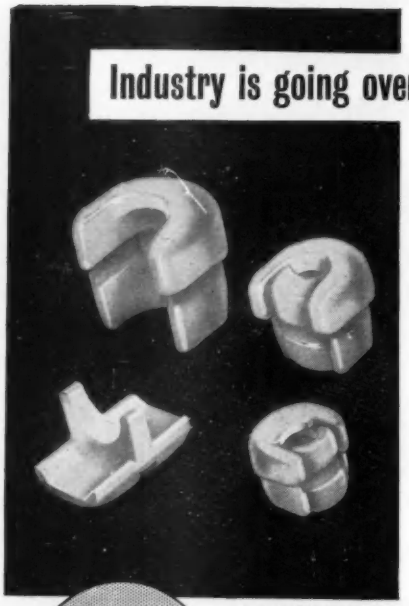
Eliminate the risk of accidents by having your Electrical Power supplies totally enclosed in an accident proof casing and still have all the advantages of a power supply when and where you need it. The E.M.S. "TROLLEYMASTER" Enclosed Collector Track is a fool-proof system of moveable power distribution and is designed to reduce the danger from trailing flexible leads and exposed conductors.

Ideal for the supply of power to machines or equipment such as small mobile cranes and hoists, etc., it may be used to advantage on certain types of process work, and as many trolley collectors as required can be run from the same conductor rails. The "TROLLEYMASTER" is designed for 400 volt 3 phase supply with maximum load of 100 amps. per phase. It is supplied in 10 ft. lengths with a weight per foot of 7 lbs.

No matter what your requirements we can supply a mobile power supply designed to meet your needs.

EMS

E.M.S. ELECTRICAL PRODUCTS LTD
COMMON LANE • KENILWORTH • WARWICKSHIRE • ENGLAND
Telephone: Kenilworth 658



Industry is going over to these Nylon Bushings in a big way

they're

NYLON STRAIN RELIEF BUSHINGS

(FULLY PATENTED)

Since their introduction to Britain from the U.S.A. I.M. NYLON STRAIN RELIEF BUSHINGS are being used by an ever-increasing variety of trades—Clocks, Radios, T/V., Fans, Toasters, Mixers, Vacuum Cleaners, Washing Machines, Portable Tools, Air Conditioners, Electric Mowers, Clippers, Drills, Saws, etc. They are rapidly becoming "Standard" where a positive, insulating, non-slip grip is essential. Made from Nylon, they grip tightly without nipping and give a streamlined appearance to the job.

Some typical applications of I.M. Nylon Bushings

Easily applied—place Bushing on wire, push into hole—that's all!

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Approved by American, Canadian, Norwegian, Standards Associations

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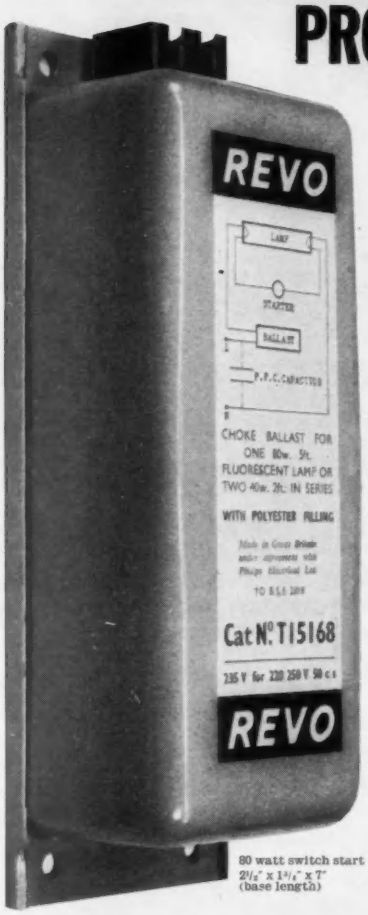
IM 42

IM49

REVO 'POLYESTER' MASTERS THE CONTROL GEAR PROBLEM



80 watt switch start
2½" x 1¹⁵/₁₆" x 7"
(base length)

Details from:

Revo Electric Co. Ltd., Tipton, Staffs.
A Duport Company
Member of the British Lighting Council

NOW REVO BALLASTS ARE

Quietest
Smallest
Coolest
Lightest
Toughest

The new Polyester technique

It surrounds coil and core completely with polyester resin. Result:

- Coil and core are completely protected, there is no atmospheric deterioration—and no 'ballast hum.'
- Size and weight are reduced. Easier to install and to adapt for many varieties of lighting.
- Polyester removes heat generated internally, and will NOT melt.

Tube performance is improved

Revo polyester ballasts guarantee a *constant* flow of energy to the tube at the correct wattage. This means maximum light output at minimum cost—and a longer tube life.

REVO MAKE A COMPLETE RANGE OF POLYESTER CONTROL GEAR

Made in association with Philips

New *low cost* electronic adjustable speed drive has general purpose industrial applications

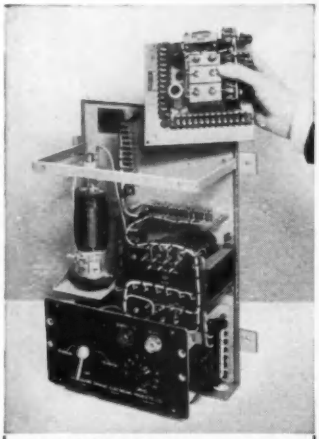
Long experience and extensive development bring to machine designers and users in this new equipment all the features of electronic drives in a simple compact easy-to-use form at an economic price.

IN RATINGS UP TO ONE H.P. this new series offers up to 20: 1 speed range, flat load/speed characteristic (within 2% from no load to full load), current limit, forward and reverse operation, dynamic braking—all at the lowest cost yet.

EASY TO INSTAL, just connect the a.c. supply and the motor — low in installation as well as first cost.

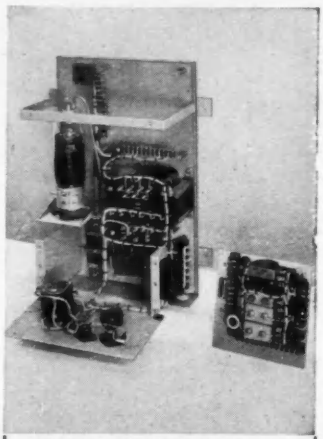
SMALL IN SIZE, (19¼" x 12¼" x 6¼") and light in weight, the units open new possibilities for built-in machine drives, using versions available without the enclosing cover for such requirements.

This new self-contained, high performance adjustable speed drive is the latest addition to Britain's widest range of electronic equipment, which includes the most comprehensive selection of specialised drives for every type of application — multi-motor speed matching, very high accuracy speed regulation, tension control, reeling and coiling and many others where controlled adjustable speed is needed.



UNIT CONSTRUCTION for economy and ease of maintenance. One control unit, easily removable with a screwdriver, is used in all ratings.

FINGERTIP SPEED ADJUSTMENT accurately sets speed despite load changes. Compact control panel provides for starting and reversing as well as speed setting.



COMPACT—YET FULLY ACCESSIBLE, the flat back wall mounting design and hinge forward control panel enable all components to be reached without difficulty.

LANCASHIRE DYNAMO ELECTRONIC PRODUCTS LTD

ELECTRONIC RED EQUIPMENT

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One of the Lancashire Dynamo Group

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HIGH QUALITY REPETITION PARTS AND ASSEMBLIES AT KEEN PRICES FOR ALL MANNER OF TRADES. MAY WE SUBMIT AN OFFER AGAINST YOUR SAMPLE OR DRAWING?

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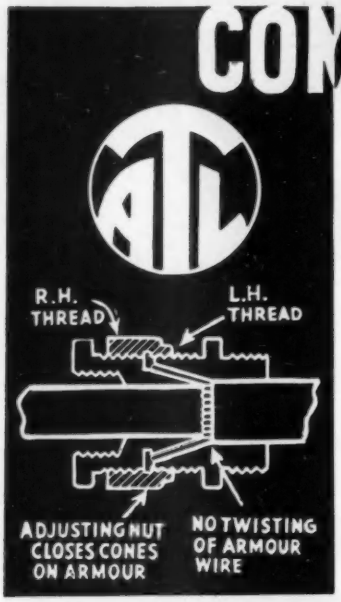

This range is designed for P.V.C. or Polythene insulated S.W.A. and P.V.C. sheathed cables.

The enclosed clamp ensures no twisting of the armouring and excellent continuity.

AUSTIN TAYLOR ELECTRICAL LTD.

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Tel.: FAILSWORTH 3246

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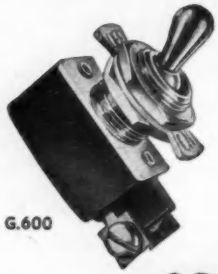
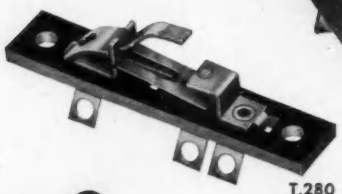
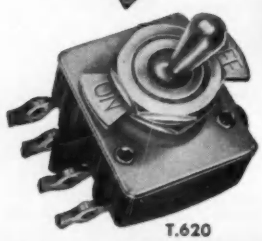
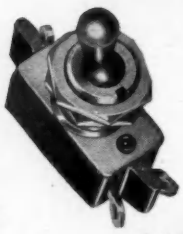

G.600

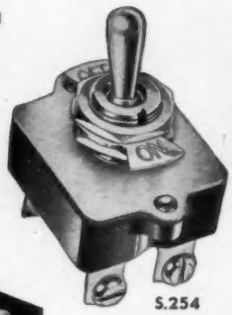

T.280



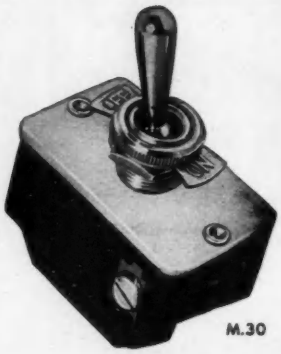
T.620


T.612

S.930



S.254



M.30

M.30	10-AMP switch for electric fires
S.254	Double pole 10-AMP switch, A.C. only
T.280	Sensitive snap action switch
G.600	3-AMP toggle switch
T.620	Double pole 3-AMP toggle switch
T.612	3-terminal S.P. change-over switch
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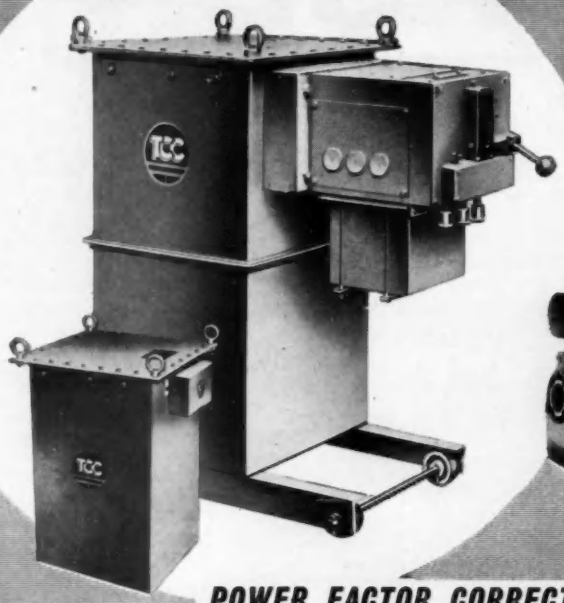
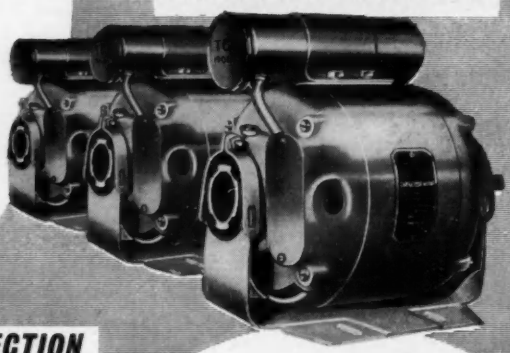
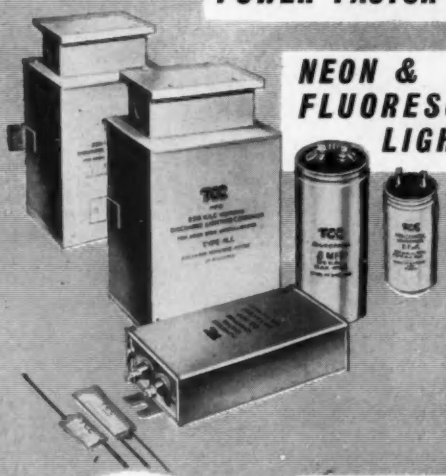


A.C. MOTOR STARTING



POWER FACTOR CORRECTION



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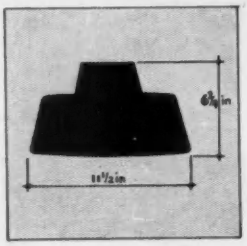
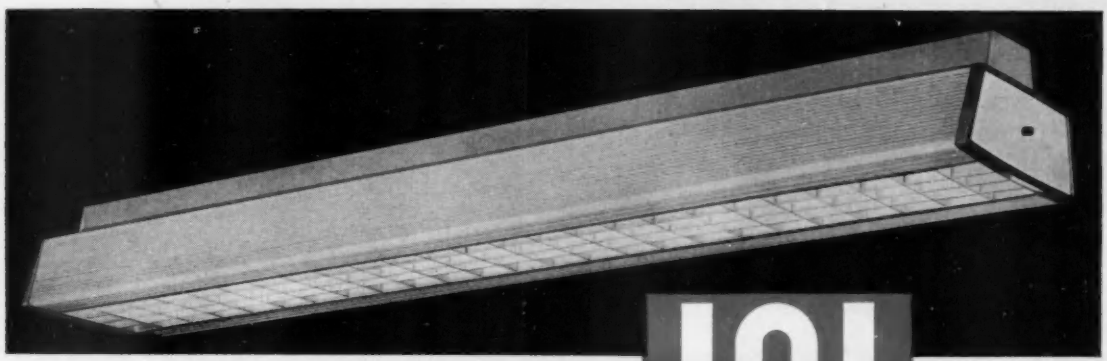


one of many decorative designs

The brilliantly successful G.E.C. 101 range of fluorescent fittings offers a wide choice of designs for every lighting requirement — in executive offices, showrooms, shops and stores, as well as factory areas. They are made for 1½ to 8 ft. single or twin Osram guaranteed tubes, and all employ the famous G.E.C. Basic Channel with its proven advantages of versatility and economy in installation and maintenance.

The fitting illustrated, F41130/1, has sides of reeded 030 'Perspex' and a white louvre. The ends are polished brass with an inset white panel. The top and bottom openings of the 'Perspex' are similar and the enclosure can be used as shown, or inverted.



101 range

fluorescent lighting fittings

G.E.C.

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This AUSTINLITE Rotary Switch

. . . was developed to do a special job—the multicircuit and sequential switching of currents up to 60 amperes. There are similar rotary switches for 10, 15 and 30 amperes.

Amongst other Austinlite solutions to problems are the 10 way-and-off Rotary ; the Marginal Relay ; the Automatic Series Regulator for voltage control ; and the 'no-break' power plants and their control switchgear.

If you have a problem in electrical equipment.

ask *Austinlite* **about it**

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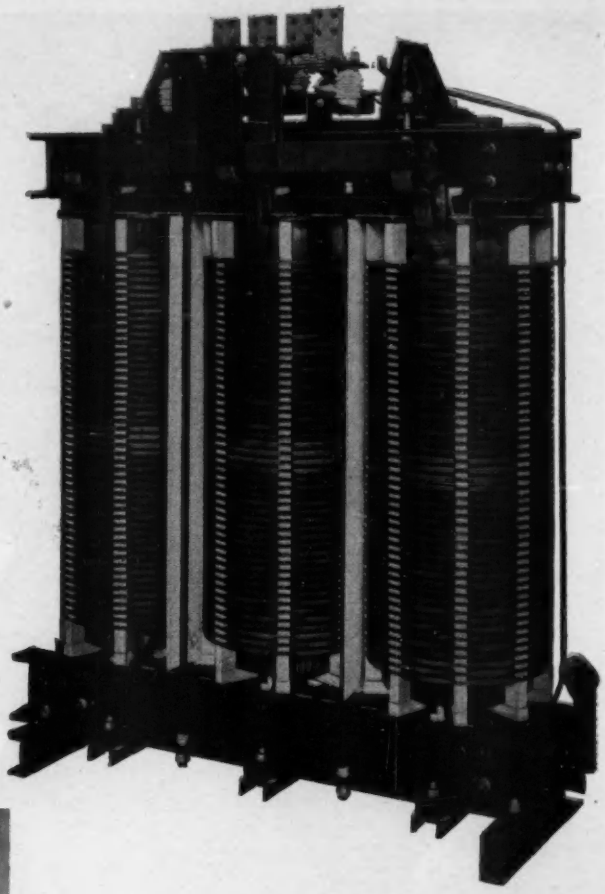
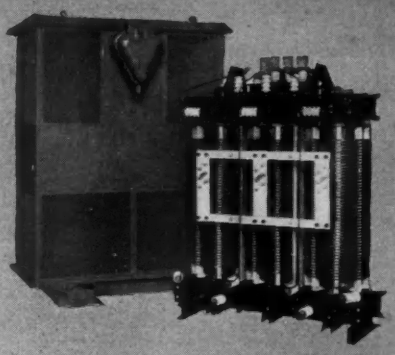
DRY TYPE
AIR COOLED
CLASS-C
TRANSFORMERS

SILICONE INSULATION SILICONE INSULATION SILICONE INSULATION





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- No Fire Risk
- Reduced Weight
- Higher Overload Capacity
- Can be installed in damp locations

For any installations where fire risk is high or consequential loss would be considerable, the introduction of the dry type air-cooled Class 'C' Transformer marks another major step in security.

Illustrated is a 1,000kVA, 3 phase, 50 cycles, 11,000/433 volts Bryce Low Loss Distribution Transformer using Class 'C' insulation.

BRYCE ELECTRIC CONSTRUCTION CO. LTD.

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In association with Hackbridge Cable Co. Ltd.

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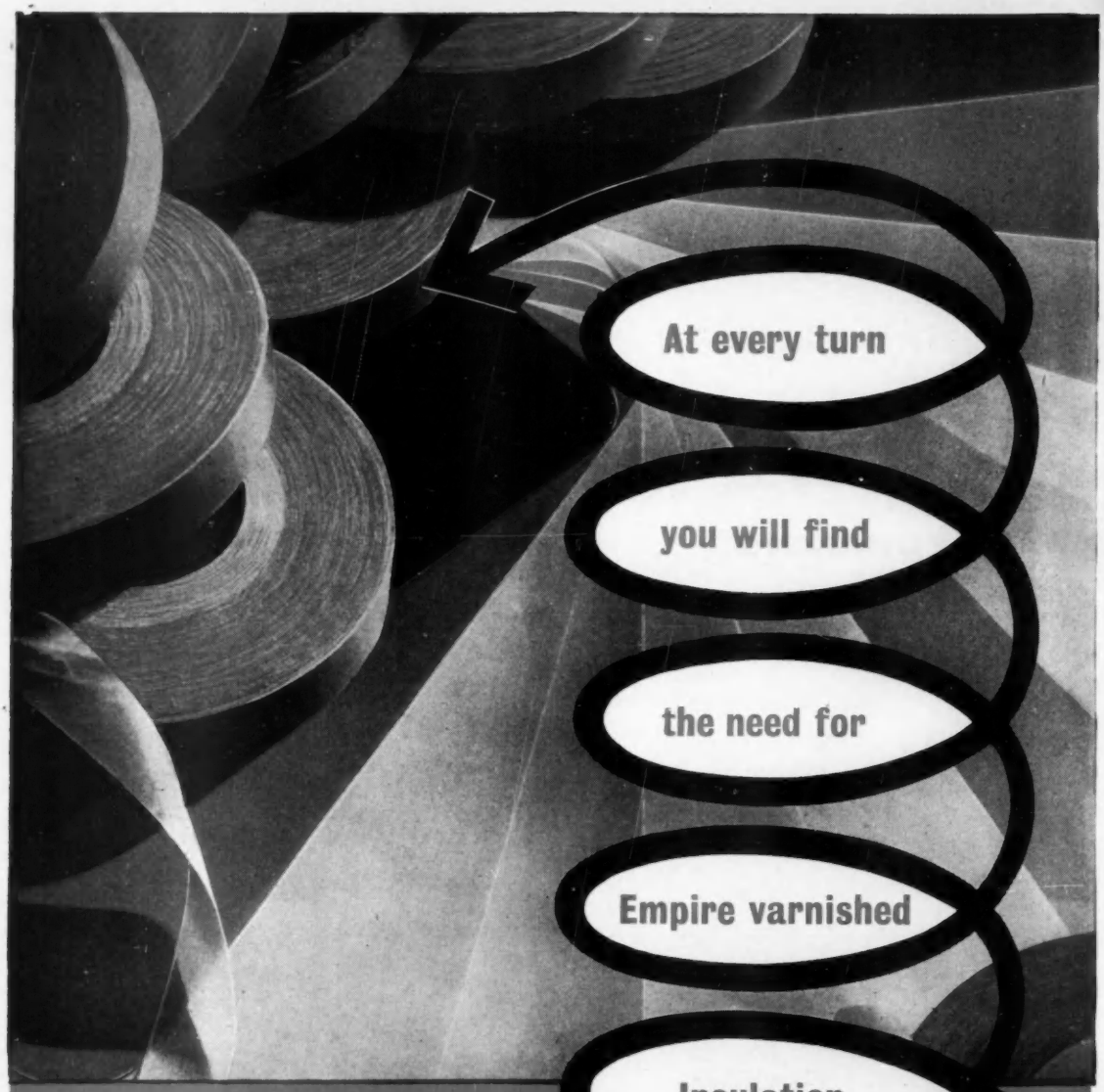

M & I make Empire varnished insulation including paper, cotton, silk, Nylon, Terylene and glass in tapes and rolls. There are grades available for insulating coils, windings, cables and other equipment in every branch of electrical engineering.

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Mica, Micanite, "PAXOLIN" laminated insulation, "PAXOLIN" cylinders for transformers, etc., "PANILAX" resin mouldings, Silicone insulation, HIGH VOLTAGE BUSHINGS & TERMINALS, Vulcanised Fibre, Leatheroid, Thermoplastic injection mouldings, PVC and Polythene extrusions. Our research staff are continually developing materials and processes to meet new requirements and our engineers are always willing to advise on problems of electrical insulation.

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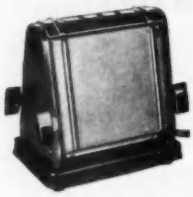

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In the home for a LIFETIME

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GROUND BASE
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2,340,000 kVA
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for the NIAGARA POWER PROJECT
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FERRANTI
Ferranti Ltd. have been awarded a contract by the Power Authority of the State of New York to supply thirteen generator transformers for the Lewiston Power Station of the Niagara Power Project situated on the plateau on the Niagara River about 3 miles below the Falls in the town of Lewiston.
The contract covers six 180,000 kVA, 13.2/240 kV 3-phase transformers and seven 180,000 kVA, 13.2/120 kV 3-phase transformers. They will be of the forced-oil, forced-water cooled, inert gas-filled type and each will be directly coupled to a 167,000 kVA 3-phase generator.
Believed to be the largest transformer contract so far placed in Britain by the U.S.A., delivery will commence in the middle of 1959 and will be completed by the end of 1960.
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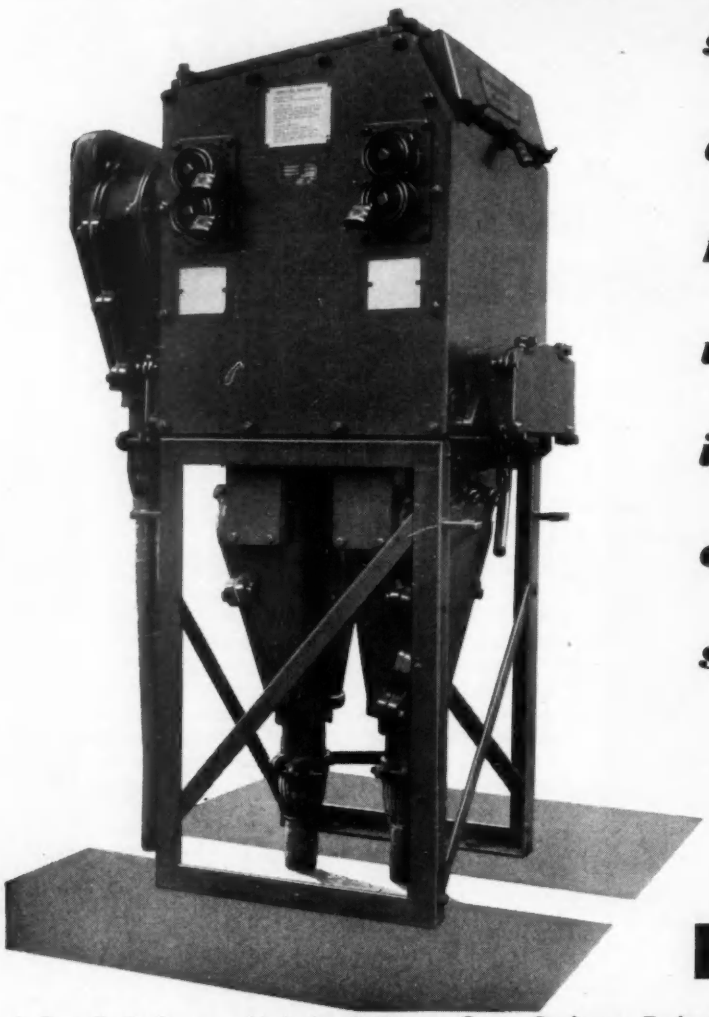
Up to 11 kV



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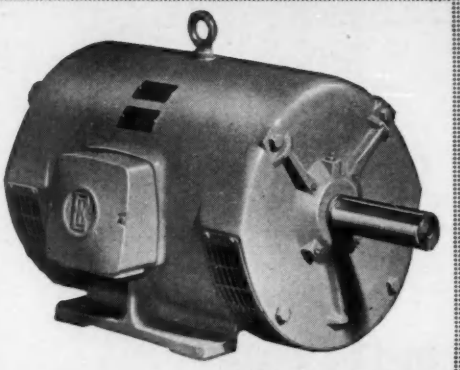

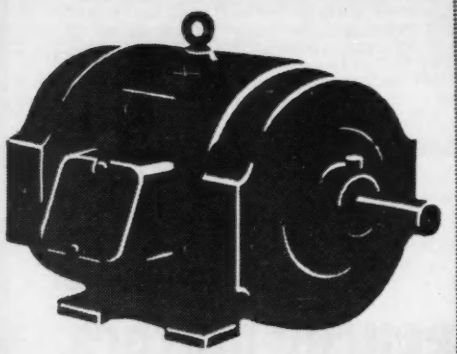

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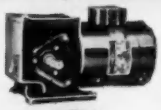

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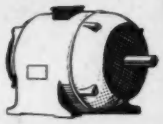
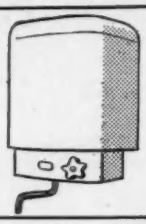


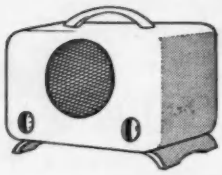
heat



control

matters

there's



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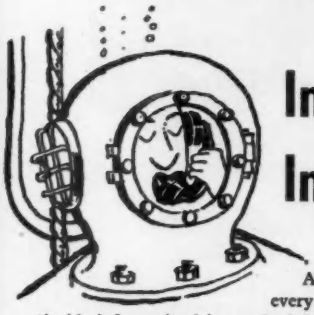

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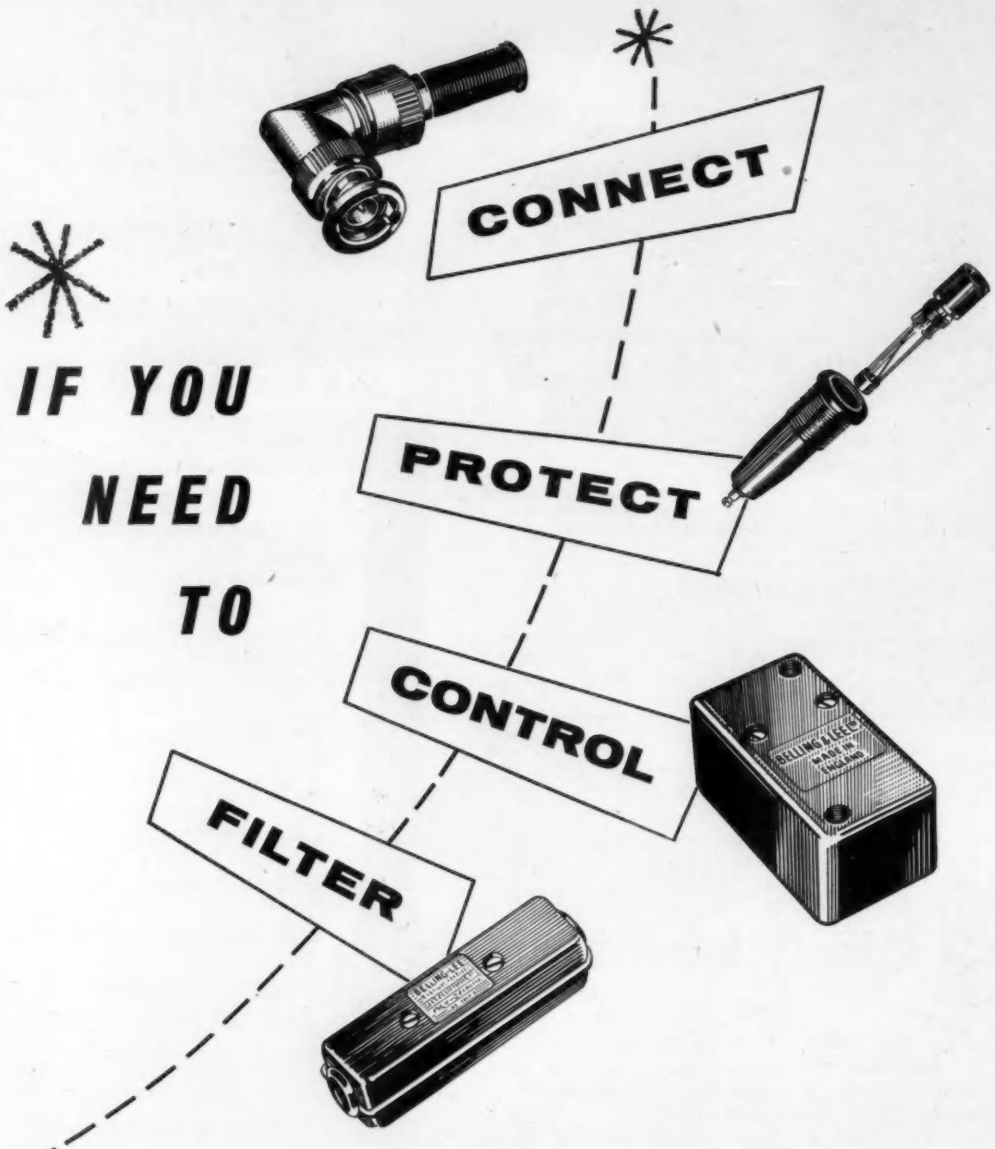

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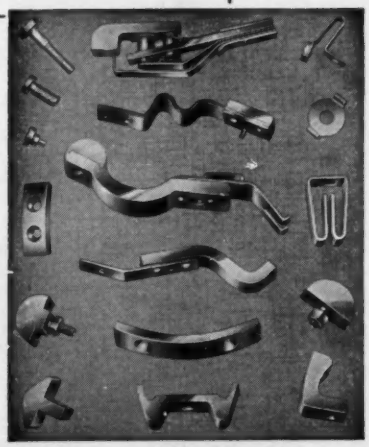

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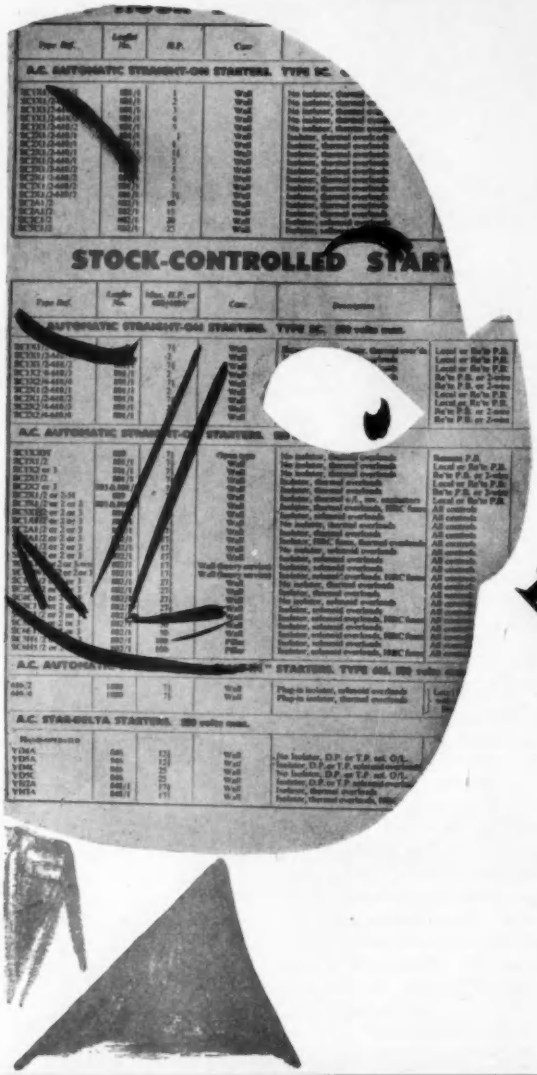

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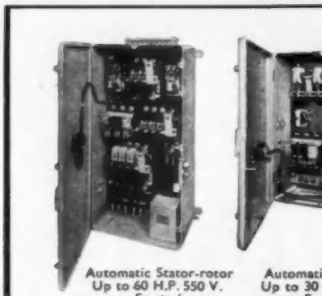

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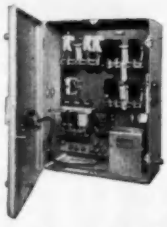

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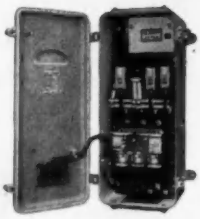

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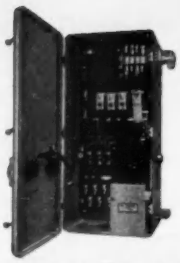

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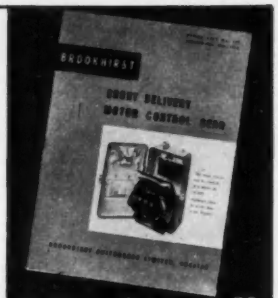

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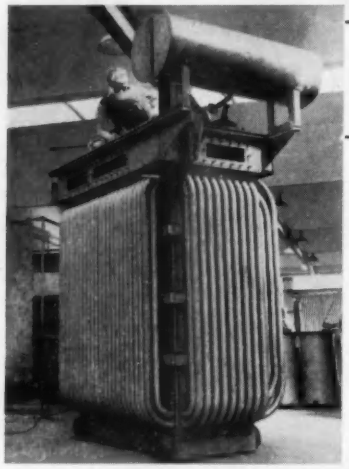

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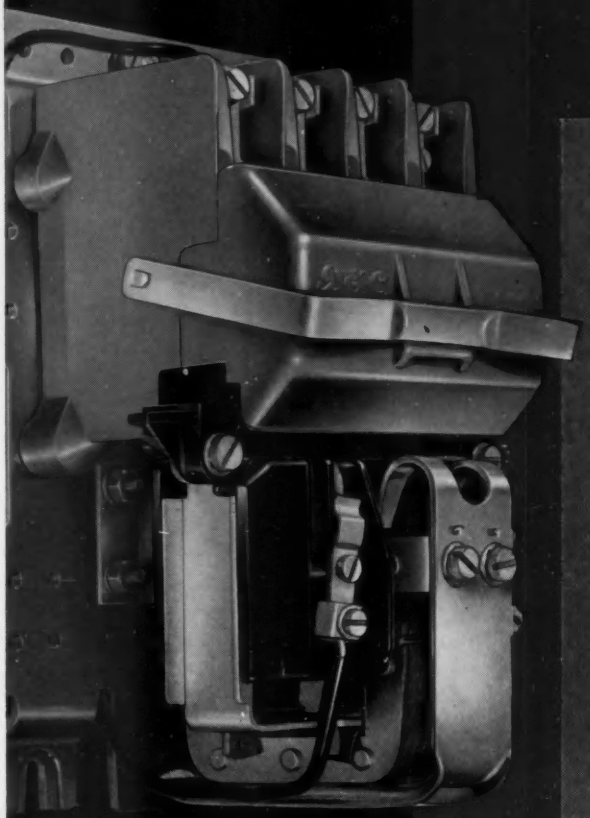

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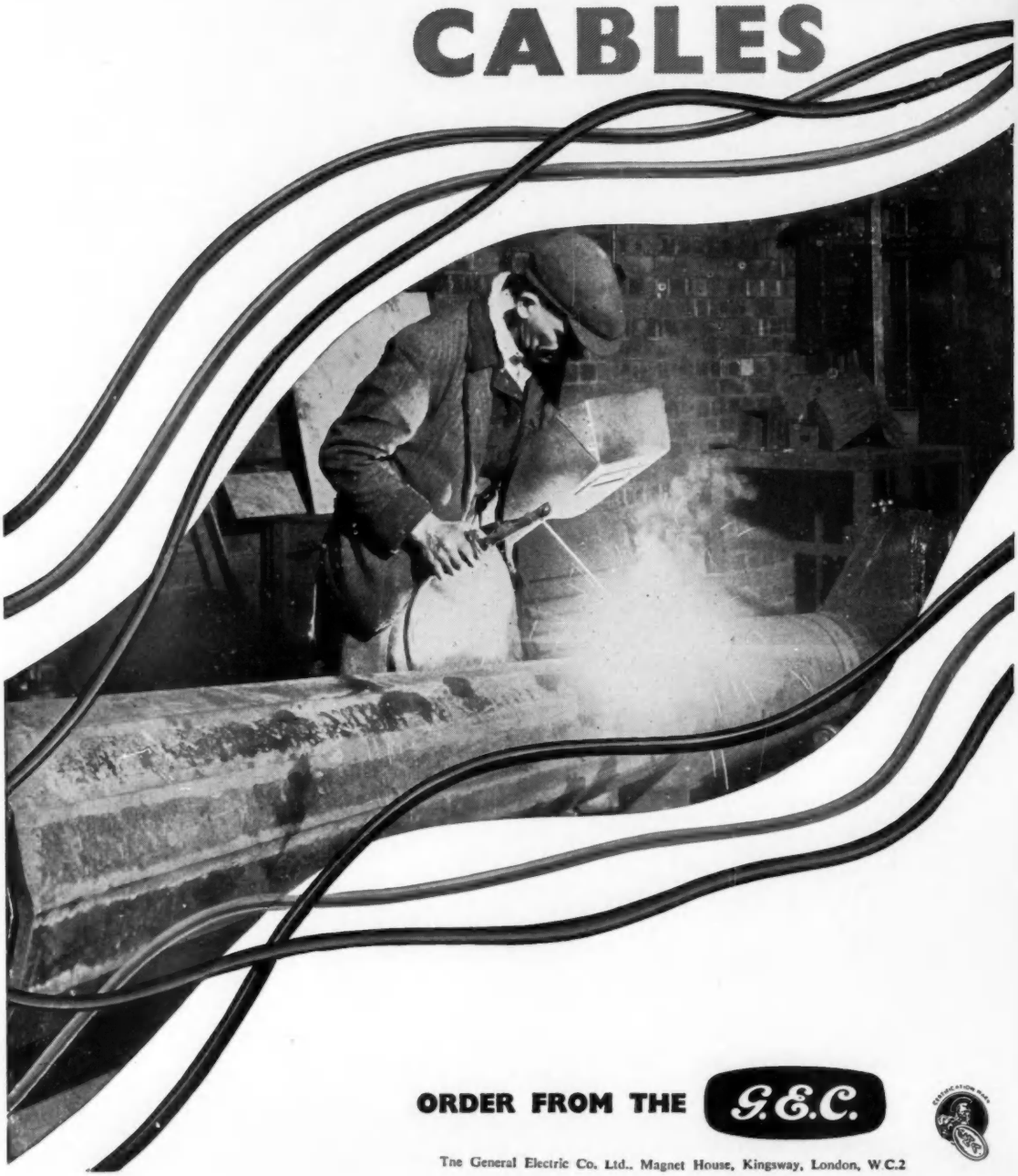

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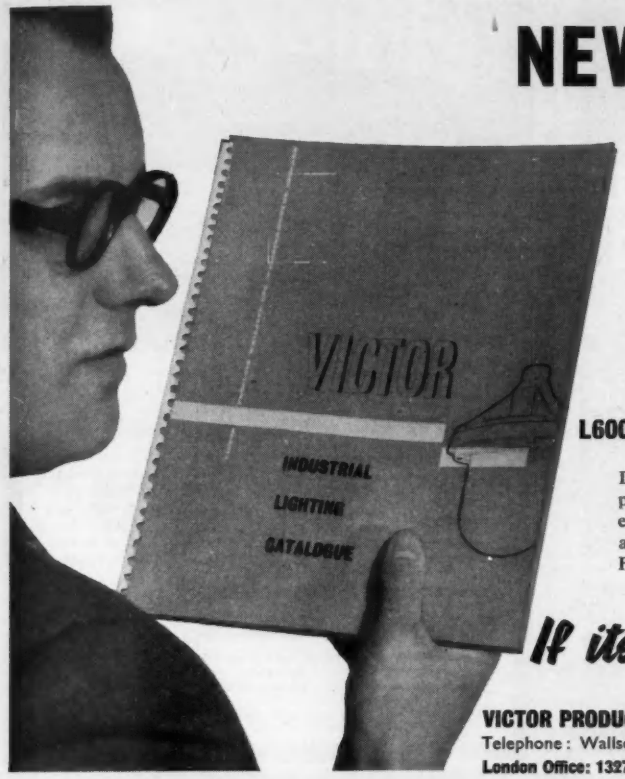

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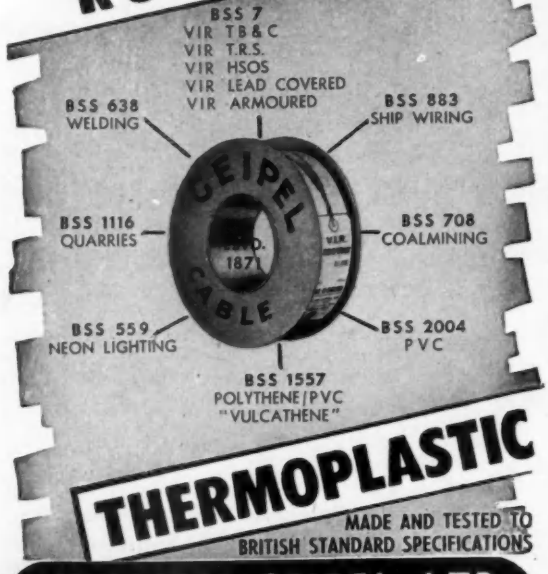

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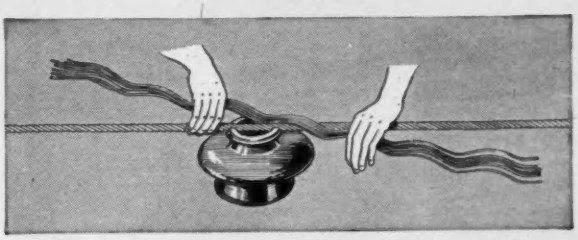

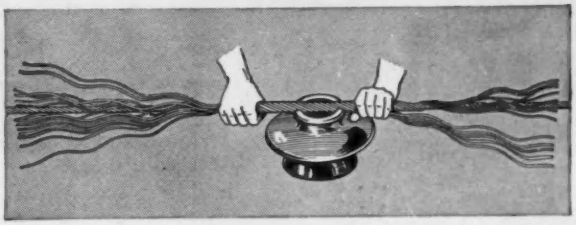

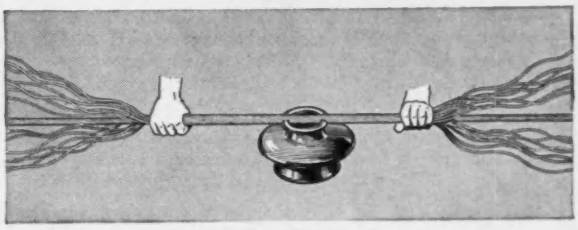

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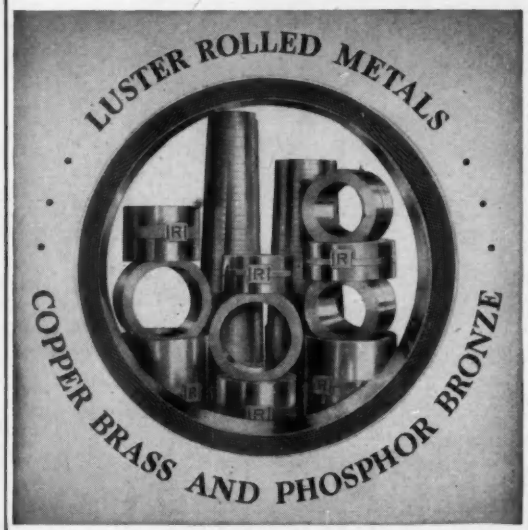

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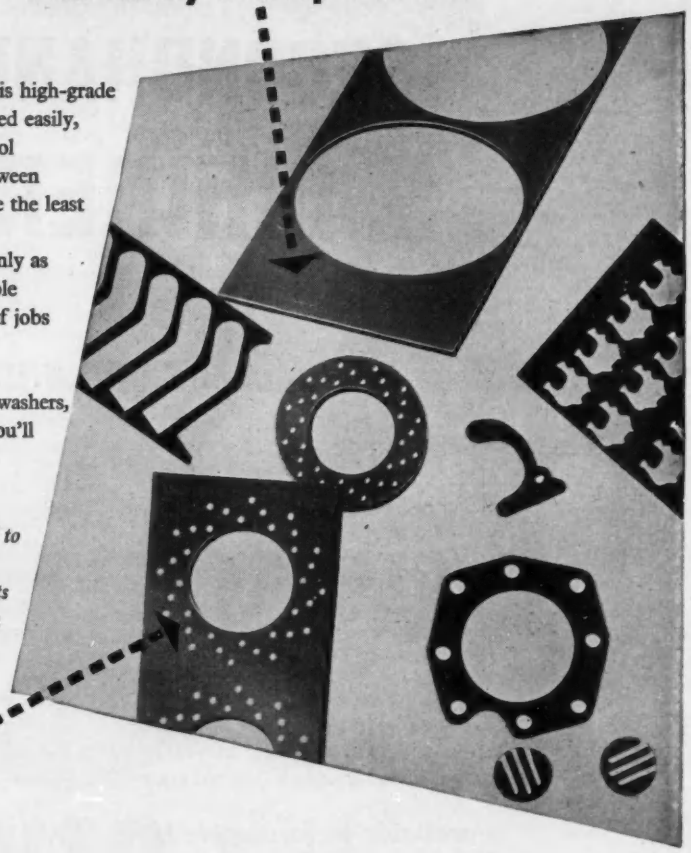

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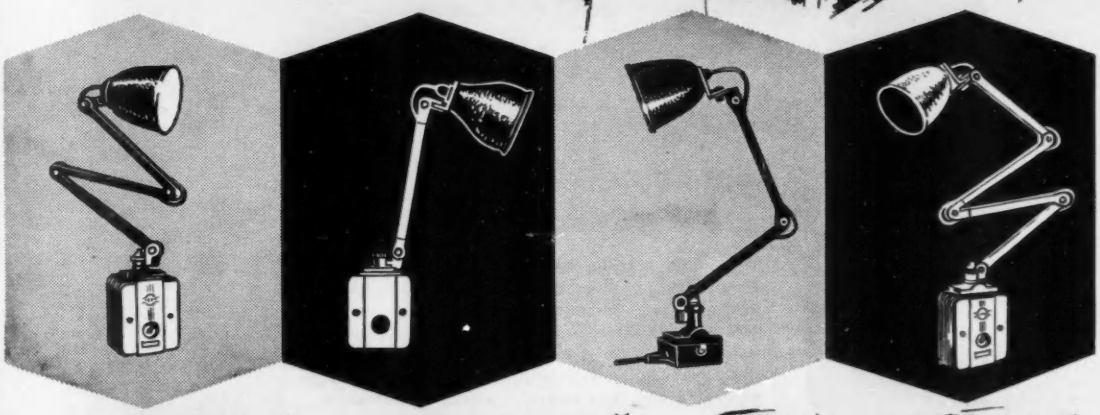

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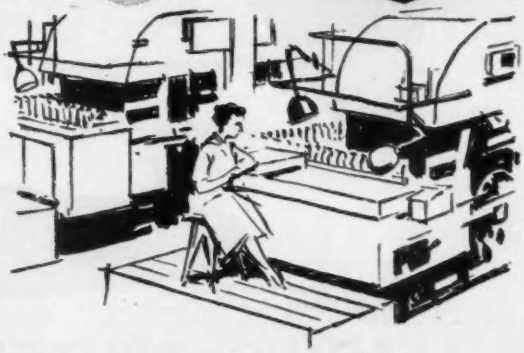

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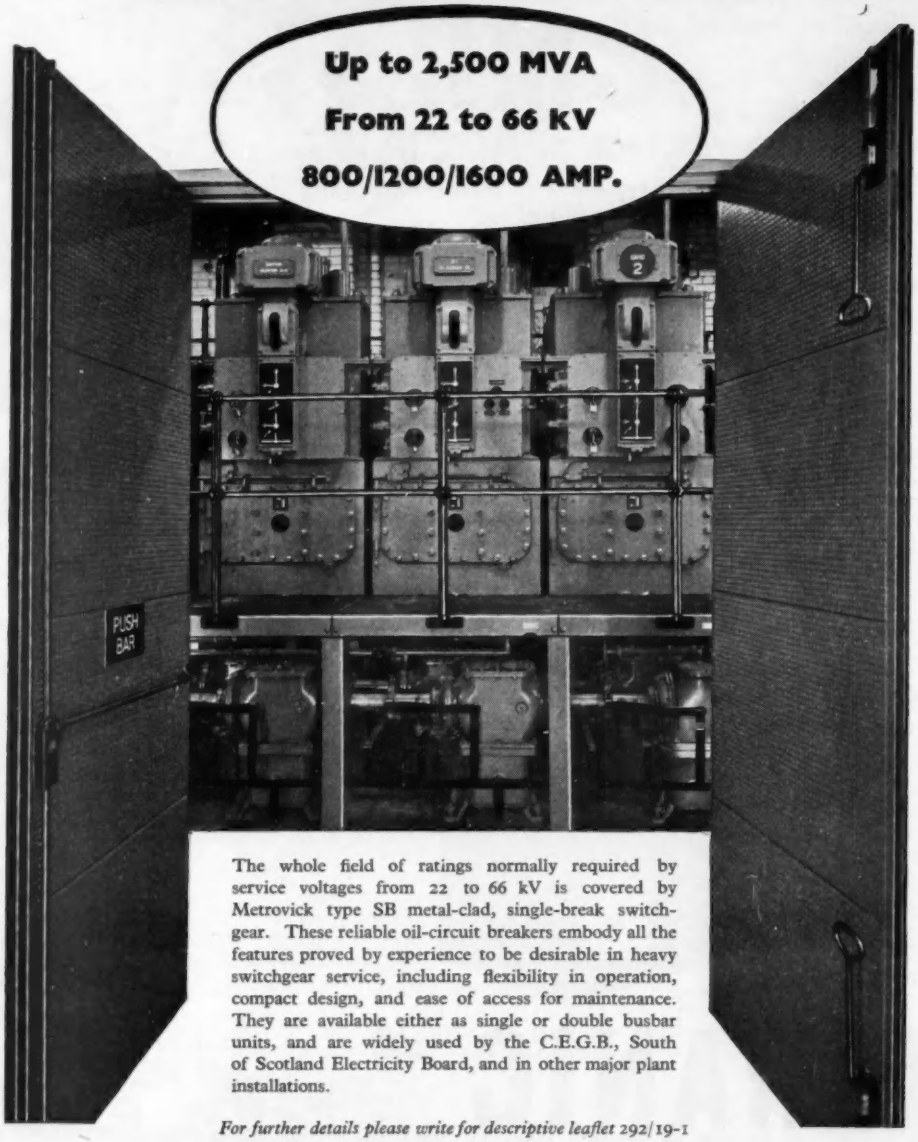

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FRIDAY
12 DECEMBER
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

A Challenge to Industry 1077

There is no technology which is generally accepted by those whose business is to design and sell floor warming systems. This situation requires remedying and attention is drawn to the series of articles by Mr. R. D. Jackson which we commence publishing in this issue. These articles attempt to establish floor heating system design on a firm footing

Bristol University Laboratories 1079

Last week the Queen opened the new Engineering Laboratories of Bristol University, which will in future be known as Queen's Building. The scope and equipment of the Laboratories are described by Prof. G. H. Rawcliffe, Professor of Electrical Engineering in the University

Electric Floor Heating Practice—1 1085

In this article, the first of a series of five, the author deals with the fundamental principles of floor warming and explains the method of calculating heat losses

Interconnection of Power Systems 1101

Although the interconnection of the British and French power systems is now to be carried out by a d.c. link, investigations into problems associated with a.c. interconnection are being pursued. This subject was discussed in two I.E.E. papers presented last week

Open Area Heating 1105

The car park for the shopping centre at Corby New Town is served by two ramps which are not sheltered from the weather. To prevent icing, electric heating cables have been installed

Subscriber Trunk Dialling 1109

At Bristol Telephone Exchange on Friday the Queen inaugurated the first stage of subscriber trunk dialling in this country. The new system is based on electronic apparatus which will interpret the code numbers dialled and operate the new charging equipment

✧ ✧ ✧ ✧

Adequate Electrical Installations 1083
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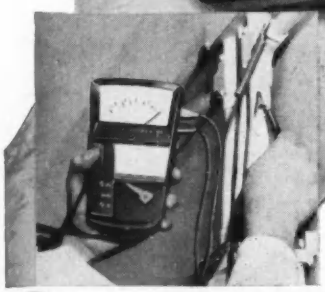

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ELECTRICAL REVIEW

12 December 1958 Vol. 163 No. 24 Established 1872

A Challenge to Industry

THERE are few subjects as controversial as electric floor warming. Most of this controversy is more concerned with the merits or demerits of particular systems than with the efficacy of this method of space heating. It has also occurred to us that the technology of floor heating rarely comes under examination and indeed one might well wonder if a technology exists at all. Certainly there is no technology which is generally accepted by the majority of those whose daily business is to design and sell floor warming systems. Consequently if an architect or consultant goes to three different parties for a scheme he will find himself faced with trying to adjudicate between three proposals substantially different in solution of the problem, heating load and annual consumption. Because of this so many architects and consultants revert to " conventional " methods of heating—hot water radiators with coal-, oil- or gas-fired boilers.

The main future for electric floor warming lies in its competition with conventional type heating systems using coal, oil or gas fuel, and it is here that this section of the electrical industry, in taking on work which in the past was the perquisite of the heating industry, opens up an entirely new field of considerable promise. The revenue to be expected from this source will affect many sections of the industry, for example, manufacturers of wires and cables, fusegear, contactors, thermostats, etc., which will replace the pipelines, control valves and boilers of the conventional heating system.

This is something of a challenge to the electric space heating industry which has to acquire a considerably greater knowledge of heating technology in the immediate future than it has at present, if it is to take advantage of the opportunities offered. There is no reason why electric space heating should not become a fully recognised specialist branch similar to, say, lighting. Indeed, the electrical engineer would scorn a heating engineer who designed a lighting installation based on some empirical formula such as 1 W/sq ft irrespective of other factors, but to an impartial observer this would not be so foolish as an electrical engineer's practice of designing a heating installation by trial and error methods.

It seems to us that the majority of electric floor warming installations are designed on the basis of empirical formulæ of one kind or another. One such formula allows a heating load of 15 W/sq ft of floor area. This is applied irrespective of building construction or height. This loading is usually related to a floor surface temperature of 72 deg F as though the relationship between the two is constant. Of course, many

installations which have been made on this basis are operating successfully, but obviously because the heating requirements are less than the installed loading. Moreover, many of these installations operate with floor surface temperatures as high as 90 deg F, but since complaints are comparatively few, it would appear that the average person is not so sensitive to floor temperatures of this order as might have been thought.

In view of the foregoing, it is hoped that the series of articles by Mr. R. D. Jackson on electric floor warming practice which begins in this issue (page 1085) will contribute towards the firm establishment of a technology to be used by all those who are concerned with this section of the industry. Consideration is being given to the formation of an association of electric floor warming manufacturers. This is a timely move which should benefit not only the members but also their customers.

UNIVERSITY EDUCATION

The basic conception of a university is to teach or encourage the undergraduate to think systematically whilst the main purpose of a technical college is to impart specific knowledge. The whole layout of the new building for the Faculty of Engineering at Bristol University has been designed with an emphasis on experimental work so that, in the main, the students are teaching themselves. This new block was opened by the Queen last week and is described in this issue.

The centre block of the building contains lecture theatres, class rooms and offices, while the two wings contain the laboratories. The University is fortunate in having plenty of space in the laboratories themselves and separate rooms have been set aside for post-graduate research laboratories and offices. The most interesting feature is that the electrical engineering laboratory incorporates a workshop in which research equipment can be manufactured. Bristol is also one of the few universities in the United Kingdom to have facilities for, and carry out, considerable research into power engineering problems. The impressive new building at Bristol has helped to raise the status of engineering in the eyes of other faculties and in this respect the profession owes a debt to the University and the Society of Merchant Venturers.

TRUNK DIALLING

The first new subscriber trunk dialling system was put into full operation in Bristol last week. A description of the apparatus appears in this issue (page 1109). The equipment at Bristol embodies electronic apparatus as it was felt that a full field trial would be most useful as far as further development was concerned. Some future subscriber trunk dialling exchanges will use conventional electromagnetic apparatus, depending on the size of the exchange. It is also possible that others will use magnetic drum storage in place of the cold-cathode tubes employed at Bristol.

This equipment and apparatus for future installations has been developed jointly by the Post Office and its five principal suppliers of telecommunication equipment. They are to be congratulated on their co-operation which has been working very well for many years. As Mr. Marples, the Postmaster General, said recently, the development of new telephone equipment in this country has been the main reason for the large export trade in telecommunication apparatus. Another point brought out by Mr. Marples is that the introduction of STD has been facilitated by the very helpful attitude of the trade unions concerned. Mr. Marples has promised that no Post Office staff will be dispensed with because of the introduction of this system.

LONDON BOARD'S SCRAP METAL

The assessment of a fair price for scrap cable involves so many considerations that a formula is not easily arrived at. Possibly if the quantities are big enough to warrant it the cable can be sorted and classified for sale but this might be too expensive a method for comparatively small amounts.

Complaints arose last year about the London Electricity Board's system of disposing of scrap cable, but Mr. Henry Benson, who was appointed to investigate them, comes to the conclusion that the Board was justified in adopting and adhering to that system. He does, however, suggest a periodical independent checking of tender prices.

There were allegations of malpractices on the part of members of the Board's staff. Mr. Benson finds that they are unsupported by fact or evidence. In one instance, however—involving the purchase of a car from scrap merchants by an officer of the Board—although the officer is said not to have attempted to influence the acceptance of tenders (and in fact was not in a position to do so), Mr. Benson deprecates transactions of this kind. He also suggests that the acceptance by members of the staff of Christmas presents from scrap metal merchants, although non-venal, is undesirable.

CABLE-MAKING RATIONALISATION

Another big step in the rationalisation of the cable industry was announced last week—an offer by British Insulated Callender's Cables, Ltd., to acquire by a share exchange the whole of the capital of the Telegraph Construction & Maintenance Co., Ltd. (" Telcon "). The offer is to be transmitted to the Telcon shareholders by the end of the year and a 90 per cent acceptance is required to make it effective.

Already the acquisition by the A.E.I. of W. T. Henley's Telegraph Works Co., Ltd., is proceeding and so two companies whose foundations were laid at the very beginning of cable manufacture lose their independence. In both cases, however, the companies are to be continued in existence and so presumably their well-known names will still be seen.

There is no doubt that there has been over-investment in cable-making plant which has not been matched by an equivalent rise in demand. Thus there is an immediate need for " some form of integration and rationalisation " (to quote the B.I.C.C. statement). It is to be hoped, however, that the slackening of demand is merely temporary. Indeed the need for more cables already exists in this country for distribution has been somewhat neglected while the provision of generating plant has been so urgent.

Fig. 1.—Aerial view of the new Engineering Laboratories. The convex side of the building faces south to the city

The Queen about to open the main door of the building, with a key presented to her by the architect

BRISTOL UNIVERSITY LABORATORIES

Opening Ceremony Performed by Her Majesty the Queen

By G. H. RAWCLIFFE, M.A., D.Sc., M.I.E.E.*

Although the laboratories at the University of Bristol necessarily have many points of similarity to those in other universities, they are especially well equipped on the heavy electrical engineering side. A distinctive feature is the workshop in which much of the experimental and research apparatus is wound or made

THE new Engineering Laboratories of the University of Bristol which have recently been completed were opened by Her Majesty the Queen, accompanied by His Royal Highness the Duke of Edinburgh, on Friday last. The foundation stone of the building, which by Royal Command is to be known henceforward as Queen's Building, was laid on 14th December, 1951, by Sir Winston Churchill, Chancellor of the University. Sir Winston again visited the building, when it was part-completed, in November, 1954, when he unveiled a tablet commemorating the long association of the Faculty of Engineering with the Society of Merchant Venturers. The Duke of Edinburgh also toured the building, then far advanced and partly in use, on 15th November, 1957.

Lord Sinclair of Cleeve, Pro-Chancellor, presided at a Congregation in the Great Hall of the University on Friday last, 5th December, when the Queen was welcomed by the Vice-Chancellor, Sir Philip Morris. Lord Sinclair began the proceedings by reading a message from Sir Winston Churchill sending his good wishes, and regretting his inability to be present. After replying to the Loyal Address, and receiving a commemorative book from the Dean of the Faculty of Engineering, the Queen left the Great Hall for Queen's Building, a short distance away, where she formally unlocked the front door, and unveiled a commemorative tablet. Subsequently, Her Majesty took luncheon in the University reception room with members of Council and Senate of the University, together with civic and other public representatives.

The works of a large electrical engineering manufacturer will always be found to comprise far more than the actual workshop space used for production, and similar considerations apply to university engineering laboratories. The word "laboratories" describes collectively all those things which are necessary in an establishment devoted to teaching and research in the subject concerned; and, in addition to experimental laboratories and workshops, it thus includes lecture rooms, tutorial rooms, drawing offices, library, committee room, museum, staff rooms, secretarial offices, stores, photographic and print rooms, substation, locker rooms, cloakrooms, lavatories, kitchen, canteens, common rooms, porter's lodge, visitors' rooms and a variety of minor offices, many of these items necessarily in multiple. In fact, a surprisingly small portion of the total cubic space of university laboratories is occupied in an obviously

* Professor of Electrical Engineering, Bristol University.

Fig. 2.—The library in the new Engineering Laboratories

functional manner: only the workshops and the experimental laboratories are clearly functional, and even the workshops are bound to be very like others of similar size anywhere else.

The technical interest of such an establishment lies mainly in the work which is done in it, and university laboratories only become remarkable to a lay observer when by site, scale or function the building as a whole attracts notice. This is certainly true of the new Engineering Laboratories in the University of Bristol, which are built on a site shown in Fig. 1, which, for sheer scenic value alone, can have few parallels among university buildings in Britain.

The building provides everything required for the four engineering departments, civil, mechanical, electrical and aeronautical; and it also houses the departments of mathematics and of geology. As the building lies on the edge of a steep slope, the preliminary site work involved cutting a right-angled notch in the side of the hill, the vertical face of the cut being held back by a heavy retaining wall. As the aerial photograph shows, the laboratories are built along an arc of a circle, the central section being double-ranged and the two long thin wings having a single range of accommodation. Most of the building is thus lighted from both front and rear, and the fact that the ground floor is below ground level at the rear has caused no reduction in lighting, except for a small portion at the back of the central block. Into this portion has been put accommodation for which good lighting is less important, such as the substation.

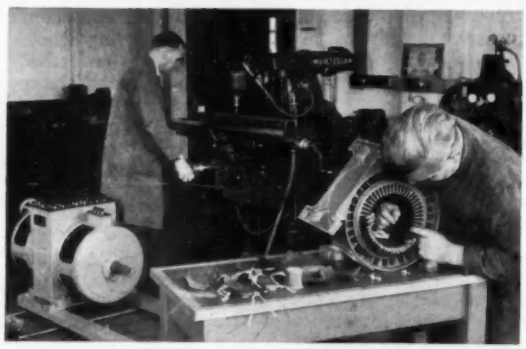


Fig. 3.—Electrical engineering workshop

Experimental laboratories occupy the whole of the ground floor, mechanical, civil and aeronautical in that order, from west to east across the arc. The electrical laboratories occupy the whole of the first floor of the west wing and a little of the centre block. The rest of the building contains all those things which are enumerated above as not being specifically functional, and which are not permanently and necessarily devoted to one particular department. For example, the long ranges of classrooms and lecture rooms are allocated by time-table to any of the departments, as required, and the library serves all six departments.

The library can be seen in the aerial photograph as a large projection at the centre front of the whole structure, and internally it is probably the most impressive room of all, Fig. 2. It has eleven bays along each side, and there is a broad gallery all round the room, and each bay is large enough to contain a table at which several students can sit and write comfortably. There is still plenty of space to approach any of the shelves, even when all the 140 seats in the library are occupied. A college library normally has to serve not only as a storeroom for books but also as a large-scale study and reading room, and the arrangements in this new library permit both functions to be served efficiently at the same time.

It is too common in university scientific departments for there to be a dearth of small offices for the staff. One often sees buildings containing relatively lavish public rooms, from which, at a subsequent date, staff offices have been uncomfortably improvised by partitioning, when the staff has been increased or the uses changed. The staff offices in this building are quite small, but they

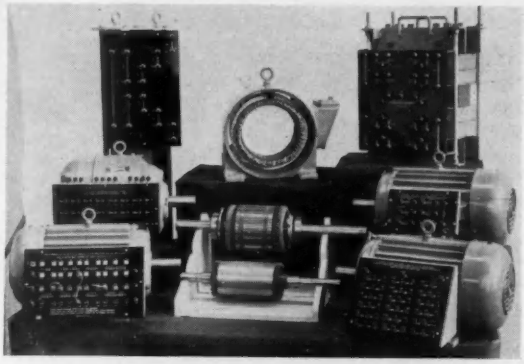


Fig. 4.—Experimental apparatus made in the workshop

are very pleasant and there are plenty of them, so that there is little need for the doubling and trebling up so familiar in many places in the past. These offices can be seen in the aerial photograph all along the second and third floors of the building, facing south across the city. The only major variation in this contract, since the work began, has been to add a further range of sixteen small offices to the top of the east wing.

In addition to the staff offices, there is an attractive staff common room which is an immense asset, both in its normal function and in relation to occasional use by outside societies, for conferences, congresses and the like.

Research Accommodation

Post-graduate and research students are a class of person whose needs have sometimes been overlooked, but they are a class which has been growing, especially in electrical engineering, in recent years. They are in attendance for a much larger part of the year than an undergraduate and spend their full working time in one department. They therefore require a home in it, where they can read and write undisturbed: they cannot just have space at a bench or in a lecture room. The new building has made adequate provision for them by a number of study-offices, suitable for small groups, where five or six research students can each have a desk and the necessary minimum of shelves, cupboards, and the rest, for the safe keeping of their books and effects.

Such a room acts as a hotbed for propagating ideas, as well as providing the necessary facilities for work; and experience shows that research students who are thus made to feel at home can hardly be persuaded to stop work at any ordinary hour. Work inevitably proceeds much more satisfactorily than if efforts are made to write and to calculate in lodgings which, if not unsatisfactory, are at least often not conducive to study. Incidentally, the University of Bristol has space in its halls of residence for about 450 men (and 300 women) and, as a policy, is expanding these halls, though it cannot hope in the foreseeable future to avoid putting many students into lodgings.

Before 1939, university finances in Britain were, in general, acutely strained; but, in the opinion of the present writer, such money as was available for pure and applied science was often spent disadvantageously. Many departments could have functioned more efficiently if the establishment had been altered to include an extra technician and a full-time secretary, at the price of having one less lecturer. Lecturers all too often used to spend time doing clerical work or maintenance duties, often rather badly. When secretarial and clerical assistance was provided, the office facilities were often poor, and no competent woman would accept such a post. All this has very much been altered in these laboratories, both in the distribution of the staff establishment and in the accommodation provided. At the present time especially, when good recruits for the academic staff are not easy to obtain, it is particularly important that those ancillary duties which could be done by others should in fact be so delegated. It will then be possible to manage with fewer or less experienced teaching staff.

The common-user accommodation of all kinds actually occupies about three-fifths of the total floor space of the building, which is about 175,000 sq ft. It remains to say something of the special-purpose accommodation devoted to electrical engineering, which is about 12,000 sq ft, and of some of the work which is done there. There is very little point in describing in detail the laboratory arrangements made so that undergraduates in the more elemen-

Fig. 5.—The advanced electrical power laboratory

tary stages may learn the standard "drill" of their future profession. The facilities for this are indeed more than good, both in electric power and in radio, but they necessarily resemble what happens in many other universities. The distinctive tone of any university engineering department is set by the project and research work which is done by honours and research students, and in this respect the department has done a great deal of unusual work.

The present writer spent the first part of his career in the heavy electrical manufacturing industry, and since the new laboratories came into service he has returned more intensively to these earlier interests. This move has met with cordial support from industrial companies, who are sponsoring an increasing number of research students to work in the department, on a variety of problems relating to dynamo-electric machinery and apparatus. For this, special provision has been made, beginning with the workshop.

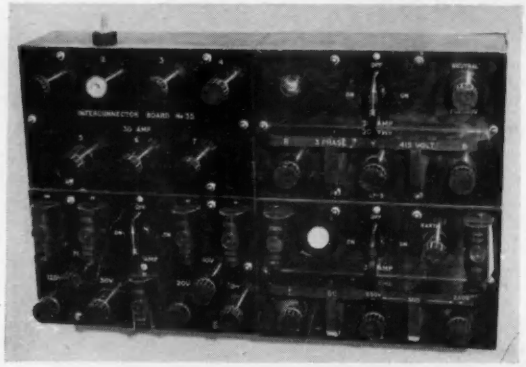


Fig. 7.—Specially designed composite terminal board

Electrical Engineering Workshop

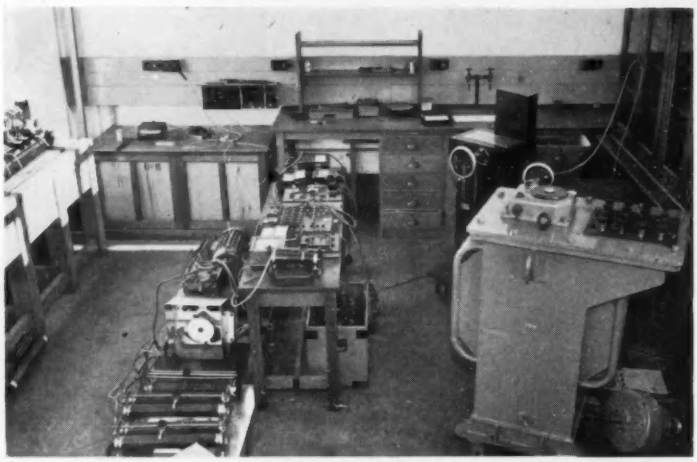
A special workshop has been included in the electrical engineering department, equipped to do specifically electrical work such as armature winding, and also general machine tool work of lighter calibre. Fig. 3 shows a standard small electrical machine frame being wound with a highly unorthodox winding, for experimental purposes. To avoid wasteful duplication, heavy machine tools have been concentrated in the workshop of the mechanical engineering department, but those technicians of other departments who are sufficiently skilled regularly make use of this workshop and some of the larger electrical work is done there.

One of the difficulties of a university department which attempts research into the problems of electrical machinery is the construction of special equipment. There is no one solution to the problem, which can only be tackled effectively by a combination of three methods. The obvious first step is to equip the workshop with machinery for making as much of the apparatus as possible within the department, and to appoint workshop staff having appropriate skill and experience. Nonetheless, it is clearly impossible to provide the equipment for performing all the more complicated and expensive processes of an electrical manufacturing firm, and the second solution is to purchase partially manufactured standard equipment and to modify it, rather than make apparatus, *ab initio*, in the departmental workshop.

A great deal of equipment has been made in this way, and Fig. 4 shows an assembly of such items, both rotating machinery and static equipment. Two transformer frames of widely differing shape will be noted, which were both industrial products, but the windings were designed here and made in this workshop. The successful pursuit of this technique requires an acquaintance with the manufacturers likely to help and a knowledge of their products, but that may be an advantage from many aspects.

The third alternative is to have special equipment made entirely by industry; but, while the department has received much help in this way, the time factor makes it impossible to rely on this in relation to most research students. The "life" of a research student is one to three years, and the time taken to have a special machine made in industry is at least a year, on the average. This is readily acceptable for permanent common-user test plant, but not for individual research equipment, except where the need can be forecast. Very often, the apparatus required is revealed only in the process of research, and if a research student cannot procure what is required in a few months he is bound to change course. At the best, such a situation will have revealed a problem for the next "generation" of research students to tackle. All these alternative ways of obtaining research apparatus have been combined with much success and so far no problem has proved intractable.

Fig. 6.—One of the small research rooms



In addition to actual research apparatus, it is necessary to provide the "tools" for research; and, for electrical machinery, this consists of a variety of generating, transforming, converting and regulating equipment. Such equipment, both static and rotating, giving a wide range of voltage, frequency and relative phase, and permitting the interconnection of a great variety of different types of equipment, has been installed in the main electrical power laboratory, Fig. 5. No individual piece of equipment exceeds 20 kW in capacity, but many visitors have remarked that within this range the equipment, to which a great many manufacturers

have contributed, is probably more varied and flexible than any other set of experimental electrical machinery in Great Britain at the present time. The illustration shows a cross-view of an advanced electrical power laboratory, from which supplies can be relayed, through a central interconnector board, to any one of the many small research rooms (Fig. 6) each about 300 sq ft in area. Several of the generators and regulators are arranged for remote control by portable pushbutton units.

The terminal boards are of distinctive design and are used for distribution throughout the building, the greatest number, of course, being included in the electrical laboratories. These boards were intended to combine the qualities of robustness, safety, simplicity, clarity and elegance. Four types of terminal board have been respectively designed for the three-phase mains, +250/0/−250 V three-wire d.c. mains (from a rectifier), 120 V d.c. battery with tappings, and the relay interconnector boards. A set of four such terminal boards grouped together at one point is shown in Fig. 7. Specially robust insulated terminals are used with a particularly large gripping surface under the head, the latter having an exceptionally long screw thread to avoid its becoming detached. All the panels except the interconnectors are separately fused and switched, and are provided with a warning light.

This equipment forms the background which has enabled a considerable number of contributions to be made in recent years, by members of the department, to the advancement of electrical power and machinery; and the resulting flow of inventions, patents and papers in the proceedings of learned bodies, especially of the Institution of Electrical Engineers, shows every sign of gathering speed.

The completion of this whole scheme is the end of the long process of, so to speak, re-founding the Faculty of Engineering. Though this was prompted nationally by the growing demand for engineering graduates, it would have been inevitable in Bristol in any circumstances, as soon as the Society of Merchant Venturers decided that the time had come to hand over their responsibility for the Faculty of Engineering. They had "provided and maintained" this since the date of the University charter (1909), as well as providing a technical college for Bristol since the nineteenth century, the latter aspect of their work having formed the starting point of the new Bristol College of Technology, which is now far advanced in development. Engineering education in Bristol is certainly well set for the years ahead.

Adequate Electrical Installations

PROCEEDINGS OF I.E.E. SYMPOSIUM

IN our last issue we published a report on the papers presented at the symposium on the provision of adequate electrical installations in buildings which was held recently at the Institution of Electrical Engineers in London.

The discussion on these papers was opened by Mr. J. I. Bernard (director and secretary, British Electrical Development Association), who said he sometimes wondered what was the philosophy of architects, builders or other persons responsible for cutting down the electrical installation to the minimum, when it could do so much for the comfort and happiness of the occupants. The cost was so little in comparison with the overall cost of construction: no more than 2 or 3 per cent of the cost of the building. He urged electrical engineers not to acquiesce so readily as they were sometimes apt to do in the cutting down of these installations.

Mr. Forbes Jackson (chairman, Wiring Regulations Committee) said it was a great disappointment to him that although the ring-main fused-plug technique offered such enormous advantages, and must have been installed in every new house since 1947, many people were not getting full advantage from it because of the insufficiency of socket-outlets.

Mr. E. J. Davies (British Electrical and Allied Manufacturers' Association) pointed out that manufacturers of domestic appliances were meeting all the demands for modern labour-saving devices, but the effective use of these appliances must not be made difficult by failure to provide enough socket-outlets. It was like offering a tramp a grilled steak and taking away his upper set at the same time!

Mr. S. L. M. Barlow (Electrical Contractors' Association) drew attention to the potentialities of miniature circuit-breakers and remarked that they were mandatory in many countries. He welcomed the suggestion that meters should be placed outside buildings; this would mean a great saving in the time taken to read them.

Mr. P. G. Negus (architect, Ministry of Housing and Local Government) pointed out that extra provision in subsidised houses, however desirable, had to be balanced against the cost, so one was between the devil and the deep blue sea. Perhaps the solution lay in the hands of the electrical industry. They had some excellent material wherewith to make known what a wonderful service they could offer at very little extra cost.

Miss M. George (director, Electrical Association for Women) said tenants of council flats and dwellings on new housing estates probably represented the biggest potential buyers of electrical appliances and it would be a sad day for the electrical industry if they were condemned to one socket in the kitchen. All the social and economic tendencies of the moment indicated that more socket-outlets were required and there would be enormous developments in the next few years, so that what was an adequate minimum at the moment would no longer be so. There was a lot to be done in public relations and education to convince the public that they needed adequately wired houses.

Mr. W. Fordham Cooper (Deputy Senior Electrical Inspector of Factories) said architects could do much to help by making sufficient allowance in their designs for the essential electrical equipment which would no doubt be larger in the future. Again, a few extra empty ducts would save a lot of expense, cutting up of concrete and unsatisfactory work in the future. He appealed to industrial designers to provide something a little more practical and efficient than some modern fittings. Designers of industrial buildings might remember that lights had to be maintained. One steelworks had pro-

vided a special catwalk near the roof for this purpose which would save its own cost in time.

Captain C. E. Mills (insurance interests) pointed out that fires directly attributed to the basic installation, switchgear, cables and flexes, amounted to about 2,800 a year, or 5 per cent of the total fires in the United Kingdom. Overloading of circuits and temporary extensions were obvious risks. It was therefore more important than ever that cables, switchgear, fusegear and so on should be amply rated in order to cope with existing and future loads.

Mr. R. Baldwin (*Electrical Times*) emphasised that there were two types of adequacy—user adequacy and technical adequacy. The former largely concerned domestic installations, socket-outlets, wiring points and so on. An authoritative committee should, he thought, be set up to produce a simple and straightforward guide. It should be representative of all sections of the industry and of user interests. Perhaps the supply industry might set the ball rolling. Any scheme produced would require to be backed by a publicity campaign. If a grade mark were associated with the guide, this could be translated by the speculative builder into a selling point.

Mr. E. J. Sutton (chief technical officer, National Inspection Council) said that this was the opening gambit in a positive campaign which must do more than express pious hopes that architects, local authorities and builders would listen to the industry's pious words of wisdom. To back up adequate socket-outlets there must be an adequate wiring installation and this was one of the concerns of the National Inspection Council.

Mr. P. E. M. Sharp said he was sorry one great value of miniature circuit-breakers had not been stressed: that the fuse could not be of the wrong rating. As to p.v.c. he pointed out that p.v.c. cable was not recommended for d.c. which a number of industrial installations required.

Colonel B. H. Leeson (director, B.E.A.M.A.) said that whether members knew it or not the symposium was the beginning of a campaign the first stage of which was for those who must be associated with it (the profession and industry, architects and builders) to decide what they wanted. A great deal was going on behind the scenes which would later come out in public.

Mr. J. A. Robbins (J. A. Crabtree & Co., Ltd.) remarked that most of the comment had been directed towards housing. Perhaps the answer was that basically housing installations were not planned by qualified electrical engineers. He supported the use of miniature circuit-breakers which were convenient and an ideal means of control. More should, he thought, have been said about earthing, since a high percentage of fires was associated with earth leakage.

Mr. J. O. Knowles (chairman, B.E.A.M.A. Council) commented that if housing committees continued the practice of putting in so few plugs, they would have difficulty in getting the best tenants in five or ten years' time when people were able to choose which council house they would have.

WIRING REGULATION INTERPRETATIONS

THE sixth group of interpretations of the 13th edition of the I.E.E. Regulations for the Electrical Equipment of Buildings includes the following replies to inquiries:—

The use of p.v.c.-insulated, non-sheathed cables is recognised only for installation on cleats or in conduit and not for wiring between consumers' buildings. The Regulations do not preclude the installation of p.v.c.-insulated, non-sheathed cables on cleats on the exterior surface of a building, however, and no objection has been raised to their use where exposed to direct sunlight. Outdoor use of p.v.c.-insulated or p.v.c.-sheathed cables is implied in B.S.2004 "P.V.C.-Insulated Cables and Flexible Cords" and in B.S.2746 "P.V.C. Insulation and Sheath of Electric Cables." The latter Standard, in a note to Clause 4, states that for the best weather-resisting properties, the insulation of unsheathed outdoor cables should be black. Regard must be paid to Regulation 206 and Table 7 for the colour identification of conductors, which may, where desired, be effected by the use of coloured sleeves or discs.

To comply with Regulation 301(B), fuses or circuit-breakers used to protect single- or three-phase circuits installed in a common conduit or trunking must normally be rated for a voltage not less than the maximum r.m.s. voltage difference which may be present between the cables. Fuses or circuit-breakers protecting individual low-voltage circuits and fed from cables run in such a common trunking need only be rated for the low-voltage circuits concerned, provided that Regulation 109 is fully observed. This requires enclosure in earthed metal or incombustible insulating material, and, unless units connected to separate phases are 6ft or more apart, the means of access must be marked to indicate the maximum voltage present. If, however, any of the outgoing wiring from the single-phase fusegear is housed in the same enclosure as wiring connected to a different phase, the single-phase fusegear concerned must be rated for the maximum voltage difference between phases.

Regulation 507 requires that each complete installation, and if possible each final sub-circuit, be tested by means of an earth-fault-loop impedance tester. If each final sub-circuit is so tested and the requirements of Regulation 406—a sufficiently low impedance of the earth loop to permit a current three times the rating of the control fuse to flow—are found to be satisfied, it is not normally necessary for a separate test of earth-continuity conductors to be made. This Regulation is intended to ascertain the impedance of the whole circuit involved in an earth fault, and can only be applied after the installation has been connected to the supply. It may be convenient, at an earlier stage, to make a test of the integrity of the earth-continuity conductors of that installation. In such a case the methods set out in Regulation 508 should be used.

It has been suggested that a collection of interpretations abstracts issued in the form of a companion volume to the Regulations would be useful. Users who would find such a volume helpful are requested to inform the secretary of the Institution of Electrical Engineers in order that the likely demand may be assessed. Reprints of the earlier groups are available from the Institution, price 6d each.

I.E.E. Western Centre

THE I.E.E. Western Centre is to hold a summer meeting at the Carlyon Bay Hotel, South Cornwall, from 8th to 11th May next year. Members who intend to be present are asked to notify Mr. W. D. Morgan, hon. assistant secretary, 123, Victoria Street, Bristol, 1, by 20th December, also stating the number of their guests, so that the Committee can decide whether the numbers will be sufficient to justify the reservation of the whole of the hotel.

Electric Floor Heating Practice

1. Fundamental Principles and Heat Loss Calculations

By R. D. JACKSON*

In electric floor heating most of the heat emitted is radiant in character and the temperature distribution within a floor-heated space is quite different from that achieved with systems relying mainly on convection. In this, the first of a series of five articles, the author explains the calculation of the heat losses involved

FLOOR heating is a method of space heating by which the conditions associated with the health and efficiency of occupants are maintained by heat emission from the floor surface in the space concerned. The major part of the heat emitted is radiant in character, and the temperature distribution within a floor-heated space is appreciably different from that achieved with systems relying mainly on convection.

The temperature distributions typical of those experienced in single-storey buildings with floor warming and convection systems are shown in Figs. 1 and 2, and it will be noted that with floor warming the air temperature gradient is the reverse of that for convection heating, i.e. the air temperature is highest near the floor, and lowest near the ceiling; also, fabric temperatures are slightly higher.

Fig. 1

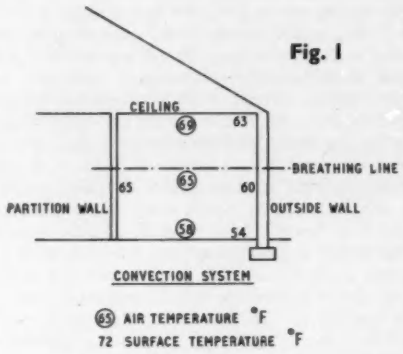
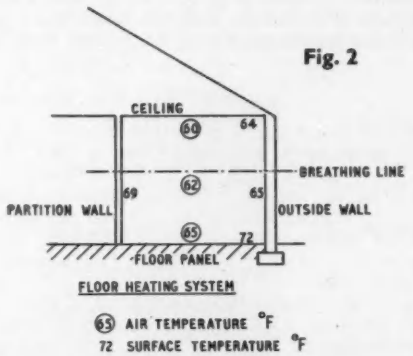


Fig. 2



However, these are features not taken into account in the calculation of heating requirements for floor warming installations, these calculations being based on the conventional data contained in the handbooks made available from the various authoritative sources. Thus the differing results shown in Figs. 1 and 2 are achieved on the basis of similar calculations and similar B.Th.U. outputs.

Most heating systems employ heating surface in one form or another, whether it is a hot water radiator, a pipe coil, a plain surface such as with panel heaters, or an ordinary electric fire element, and in order to emit heat this heating surface must stand at a higher temperature than its environs.

This difference in temperature is one of three factors affecting total heat transmission, the others being the coefficient of transmission for the type of heating apparatus, and the area of heating surface.

Hot water radiators commonly operate with a mean water temperature of 160 deg F against a room temperature of, say, 60 deg F, whilst floor warming, if installed in the same space, would operate with a maximum floor surface temperature of 75 deg F. The difference between room and heating surface temperatures would therefore be 100 deg F for the radiator and 15 deg F for the floor warming.

Hot water radiators commonly have a coefficient of 1·6 B.Th.U. per hour per square foot of heating surface per degree Fahrenheit difference in temperature between the surface of the radiator and the room. The coefficient for floor heating is taken as 2 B.Th.U./hr/sq ft/deg F. As an example, if a room requires a total of 160 B.Th.U./hr from heating surface, the respective areas would be:—

Hot water radiators: $\frac{160 \text{ B.Th.U./hr}}{1{\cdot}6 \times 100 \text{ deg F}} = 1 \text{ sq ft}$

Floor heating: $\frac{160 \text{ B.Th.U./hr}}{2 \times 15 \text{ deg F}} = 5\frac{1}{3} \text{ sq ft}$

Thus, with floor heating the temperature differential is kept to a very low level, and a wide diffusion of heat input is achieved by employment of large areas.

Owing to the comparatively small difference in temperature between the heating surface and the space where

* Technical Director, Tyrad Electric, Ltd.

FIG. 3.—HEAT LOSS CALCULATION SHEET

OUTSIDE TEMPERATURE..... ELECTRICITY SUPPLY..... INTAKE HOURS.....

Room	Air				Windows and Doors				Walls				Roof Glass				
	Dimensions	Vol. cu ft	"U"	B.Th.U./h/°F	Dimensions	Area sq ft	"U"	B.Th.U./h/°F	Dimensions	Area sq ft	"U"	B.Th.U./h/°F	Dimensions	Area sq ft	"U"	B.Th.U./h/°F	Dimen

floor warming is employed, there is a natural restriction of heat output from the floor area in any space. In many cases sufficient heat output cannot be obtained with floor heating in rooms at the ends of buildings and top floor rooms, owing to the higher rates of heat loss incurred, and it is necessary to employ supplementary heating equipment.

In buildings of normal construction a sufficiently high degree of thermal storage is achieved in the building fabric for electric floor heating systems to be operated with their intake restricted to off-peak hours, thereby enabling the consumer to take advantage of the more favourable tariffs offered by Electricity Boards for this type of load. The question of off-peak operation is entirely dictated by the value of the mass available for thermal storage, and every building needs to be considered on its merits, with multi-storey buildings requiring particular attention. Intake requirements are dictated by the worst-placed room in the building.

The adoption of electric floor heating as a means of space heating is, in the majority of cases, decided solely on a basis of comparative capital and running costs, and any differences in temperature distribution or in æsthetic values are rarely considered. This is because the architect and the engineer responsible for the erection of a new building are primarily concerned with the provision of the various engineering services for the minimum expenditure commensurate with the satisfactory performance of their necessary duty.

Properly based comparisons should take into account necessary work by other trades for the type of system under review. These will show, almost without exception, a considerable overall saving in building costs in favour of floor warming. Running cost comparisons are considerably affected by the rate for off-peak supplies made available by the Electricity Board concerned. The cost of electricity may vary by 30 per cent, depending on the position of the site. If all the annual charges associated with alternative heating systems are scheduled, floor warming can be favourably placed even in high tariff areas. Capital cost is normally only determined for the purpose of estimating the annual cost by way of amortisation.

HEATING LOAD

Heat Loss Calculations

Although heat loss calculations for off-peak floor heating installations are based on conventional data as far as heating requirements are concerned, there are two essential differences to be considered by comparison with convection type systems in arriving at the heating load, namely the proportion of heat input lost in a downward direction and the loss due to air change.

The loss in a downward direction from a warmed floor does not contribute to comfort in the space to be heated, or affect floor surface temperatures, and it should therefore be treated as an entirely separate item or component of heating load to be added at a later stage, in order to arrive at the total heat input.

Heat input, therefore, has two components:—

(1) Heat emitted upwards into the heated space.

(2) Heat lost downwards non-beneficially to the space concerned.

The heat loss calculation sheet (Fig. 3) shows such an arrangement, and it will be noted that superstructure losses are totalled at the conclusion of the first stage in calculation, and in later columns the figures so derived are divided by first the air volume, and then the floor area, to show the B.Th.U. per hour requirements per cubic foot and per square foot of the space respectively.

Requirements per cubic foot appearing on the heat loss sheet serve as a convenient check on taking off and arithmetic, since a considerable similarity is usually found for the majority of rooms in the same building with the same temperature rise. Requirements per square foot at once indicate whether or not the required amount of heat can be emitted from the floor within the normal maximum of 75 deg F, since it is only necessary to divide this figure by the coefficient of transmission, the result being the difference in temperature between space and floor surface.

The overall "U" values used in arriving at the B.Th.U. losses per degree Fahrenheit for the various surfaces, i.e. walls, roofs, etc., are taken from the various handbooks on the subject, but as far as ventilation losses are concerned one air change per hour can be taken for all cases.

This is because with a thermostatically-controlled system absorbing heat and building up an internal temperature during the night, the thermostats will go over to the "off" position when the prevailing losses have been met at the prevailing rate of air change which, in a closed and probably unoccupied building, will be extremely small. There would, therefore, be no point in providing for, say, two or three air changes per hour as may be recommended for certain types of rooms or premises.

If an appreciable increase in heat loss due to ventilation occurs subsequently to intake ceasing, there is a danger of stored heat being exhausted more rapidly than normal, bringing about a general fall in temperatures. Where ventilation is expected to be higher than one air change per hour direct appliances should preferably be installed with a loading at least commensurate with the excess ventilation loss, or substantial boosting periods should be allowed during the day to replenish storage.

Although conventional "U" values are used, the temperature distribution achieved with floor heating shows the surface temperatures of the fabric to be higher

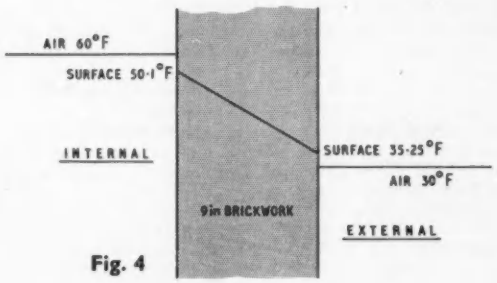


Fig. 4

Roof					Floor						Gross	Gross	Net Transmission				Remarks
"U" B.Th.U./h/°F	Total B.Th.U./h/°F	°F Rise	Total B.Th.U./h	Dimensions ft	Area sq ft	"U" B.Th.U./h/°F	°F	B.Th.U./h	B.Th.U./h	kW	B.Th.U./CF	B.Th.U./SF	W/CF	W/SF	

than with convection systems. Conventional "U" values are calculated on an air-to-air basis, i.e. the air in the heated space imparts heat to, say, the wall surface, is conducted through to the outside face, and is then transmitted to the surroundings.

These "U" values are made up of:—

(1) The internal surface resistance of the fabric, which will vary depending on the direction of heat flow.

(2) The thermal resistance of the fabric.

(3) The external surface resistance, which again will vary depending on the direction of heat flow.

For example, the overall "U" value of a 9in solid brick wall situated in a sheltered southerly exposure can be calculated as follows:—

Internal surface resistance of wall	0·6
9in brick @ 0·1 per inch	0·9
External surface resistance	0·3
	1·8

the "U" value is the reciprocal of this total resistance,

therefore $\frac{1}{1\cdot8} = 0\cdot55$ B.Th.U./hr/sq ft/deg F.

The temperature gradient through this wall is shown in Fig. 4 for a 30 deg F difference in temperatures, the loss being $0\cdot55 \times 30 = 16\cdot5$ B.Th.U./hr per square foot of wall.

The internal surface resistance is derived from the difference in temperature between the heated air in the room and the surface of the wall, but with floor heating the latter temperature is usually slightly higher, presumably due to the reception of radiant heat. This means there is a greater temperature difference between the inside and outside surfaces of the wall and thereby it would seem a greater rate of heat loss.

Using the foregoing wall construction to illustrate this point, the heat flow can be calculated using the temperature difference and thermal resistance between the inside wall face and the outside air.

Thermal resistance is:—

9in brick @ 0·1 per inch	0·9
External surface resistance	0·3
	1·2

The reciprocal of this resistance is 0·833. If the temperature difference is 29 deg F, the heat loss must be $0\cdot833 \times 29 = 24\cdot157$ B.Th.U./hr/sq ft. This is 50 per cent more than indicated by the conventional calculation. However, results justify the practice of using conventional "U" values and in any case there is an absence of alternatives.

Downward Loss

The second component of a heating load is the quantity of heat lost non-beneficially from the underside or edges of the floor and generally speaking a "U" value is applied per square foot of floor area for single-storey structures on ground. For convenience, this "U" value is usually multiplied by the same temperature rise as for the superstructure, but the "U" value itself is varied from building to building to suit the specific conditions. This is because temperature differences between heated floors and design basis remain much the same though comfort levels may vary. The "U" value is also varied to suit the plan of the building, a higher value being taken for long narrow buildings as compared with the more square type.

This variation is made because the major part of the downwards loss is really a perimeter loss, which is greater where there is a shorter path to be travelled or the perimeter is large as compared with floor area.

Little factual information is as yet available regarding heat lost downwards or perimeter-wise in single-storey buildings, although the allowances made in calculations have proved to be sufficient. The value of edge insulation may be in question from the point of view of increased capital cost and amortisation thereof as compared with the cost of the electricity which would otherwise be consumed, and the following methods may be used to arrive at approximate conclusions in this respect:—

With floors on the ground there are two different cases to consider:—

(a) Where the floor level inside the building is substantially above the ground level outside the building.

(b) Where the floor level inside the building is at or below outside ground level.

It is obvious that the first case offers a reduced resistance to edge loss and with the appreciable temperature difference between the heated floor and the external temperature, there would be a very reduced downward saturation of heat beneath the floor along the outside walls. To estimate perimeter loss it is necessary to

(1) Estimate a mean floor slab temperature.

(2) Estimate a depth beneath floor level over which the mean temperature is to be applied.

(3) Calculate a "U" value for the outside wall below floor level.

If, for example, a building has an external wall where the "U" value is 0·3, the only difference in "U" value below floor level will be due to the loss of the inside surface resistance. Thus, with the resistance above floor level of 3·3 deg F, and with the internal surface resistance of 0·7 deg F subtracted, leaving a below-floor-level resistance of 2·6 deg F, the new "U" value is 0·38.

With the floor level of the building substantially above the level of the outside ground, it would be sufficient to consider an overall depth of edge, through which heat is being lost, of 18in, and if the mean temperature of this edge depth is taken to be the same as for the floor surface, i.e. 75 deg F, the temperature rise to be applied to the "U" value will be 45 deg F, where the outside design basis is 30 deg F.

A linear value for heat loss can be arrived at thus:—

$$0\cdot38 \times 1\tfrac{1}{2} \times 45 = 25\cdot65 \text{ B.Th.U./hr.}$$

This value can be applied per foot of building perimeter.

The effect of perimeter insulation can be determined by correcting the "U" value. Thus, if the 18in depth of edge is insulated with 2in of cork having a resistance of 3 deg F per inch thickness, then the new "U" value below ground level, including insulation, is 0·11 and the linear value becomes 7·4 B.Th.U. per foot.

The saving in electricity consumption can be estimated on a degree-day basis in the usual way, but the saving indicated would be lower than would probably occur in

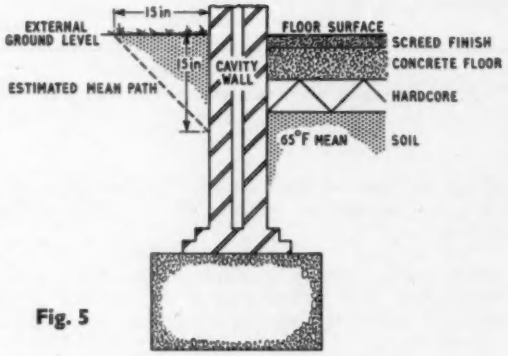


Fig. 5

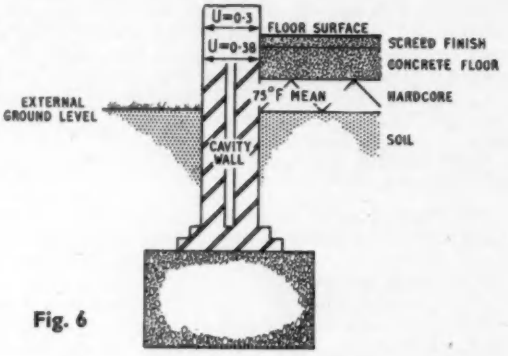


Fig. 6

practice, since the mean slab temperature is appreciably higher than the normal basis of 60 deg F for degree-days. Where the floor level of the building is at or below the same level as the outside ground, similar modifications can be made to the normal outside wall " U " value, this time allowing for the elimination of the external surface resistance of the wall being offset by the surface resistance of the ground.

In this case it would be reasonable, as an example, to assume a 2ft 6in depth of edge and that the bulk of heat flow is covered by a width of 2ft 6in on the surface of the ground on the outside of the wall. Thus, there would be a mean length of path for heat flow from the centre of the 2ft 6in depth of edge to the centre of the horizontal strip of ground surface. The distance would be approximately 21in.

Normal " U " value of wall	=0·3
∴ resistance	=3·3
Sum of external and internal surface resistances	=0·95
∴ net resistance of wall	=2·35
Soil resistance at 0·1 per inch	=2·1
Ground surface resistance	=0·25
	4·7
New " U " value	=0·213
Temperature difference	=35 deg
Width of ground strip	=2ft 6in
∴ heat loss per foot of perimeter	=0·213×35×2ft 6in
	=18·6 B.Th.U./hr

Figs. 5 and 6 illustrate the foregoing examples, and it will be apparent that the method can be used for any type of outside wall construction.

The Consulting Engineer

A PAPER entitled " The Consulting Engineer and his Contribution to National Economy " was read at a recent meeting of the Royal Society of Arts by Mr. J. S. Tritton, M.I.C.E., M.I.Mech.E., president of the International Federation of Consulting Engineers. He said that a consulting engineer was defined as a person possessing the necessary qualifications to practise in one or more of the various branches of engineering, who devoted himself to advising the public on engineering matters, or to designing and supervising the construction of engineering works. What distinguished him from other engineers who might be capable of carrying out these duties was that he had to be in a position to give independent advice.

The consulting engineer drew his clients from an almost unlimited field—Government Departments, county councils, industrial firms, etc. Experience showed that these organisations were often glad of independent opinion apart from their own engineering staff.

Although members of the Association of Consulting Engineers did not knowingly compete with one another they had to meet competition from outside the Association. Such competition came sometimes from contracting and manufacturing firms who offered consulting and designing services as part of a " package bid " or as an inducement to place orders. Occasionally the prospective purchaser was given to understand that he was getting these services free of charge, but a moment's thought would show that there was no such thing as " free engineering."

It had been argued that by calling for tenders on a single consulting engineer's approved design the client was deprived of the benefit of competition in design. This argument, however, was unsound since it was usual to allow tenderers to put forward alternative designs provided that they quoted from the engineer's design. The client had then a yardstick by which to measure the advantages and disadvantages of any alternative proposal.

Among the many services provided by a consulting engineer Mr. Tritton mentioned the drawing up of the conditions of contract as well as the design details, the supervision of the construction work by his resident engineer, inspection and valuation of the work, and the issuing of the necessary final certificates for payment.

Consulting engineers were frequently told that they were the spearhead of the export drive. It was usually assumed that a favourable project report would give a certain bias to the order being placed with a British firm but the report must be fair and unprejudiced.

Main Road Lighting

IF it is not possible for vehicles to travel on our roads without headlamps then the standard of lighting is not high enough. This point was made by Mr. Granville Berry, city engineer and surveyor, Coventry, and president of the Association of Public Lighting Engineers, when he spoke at the annual meeting of the Scottish Section of the Association at Greenock recently.

Not only should the Ministry of Transport contribute up to 100 per cent of the cost of the lighting of trunk roads, he contended, but the classified grants system should be applied to all through roads in Great Britain. The time was long overdue when adequate financial assistance should be given to local authorities to enable them to complete the task of re-lighting the roads.

Mr. J. R. Brodie, superintendent of lighting, Ayr, who introduced a discussion on the future administration of public lighting, said there was a need for a drastic reduction in the number of local authorities in control of public lighting. In Scotland there were 230 lighting authorities.

Mr. R. Kerr, lighting superintendent, Greenock, chairman of the Scottish Section, speaking at a luncheon given by Greenock Corporation, said the members felt they were playing a part in keeping the need for a high standard of street lighting before members of local authorities.

VIEWS on the NEWS

By REFLECTOR

I SHOULD not have thought that that overworked epithet "complacent" could be applied to the gas industry; it is generally pretty active and on the alert. Anyhow the South Eastern Gas Board was criticised for complacency at a recent meeting of the area Consultative Council. The matter under discussion was a pamphlet issued by the Government to housing authorities recommending that electrical appliances should be installed in old people's homes on the ground of safety. It was thought that if the gas industry had appliances which were equally safe it should "get on its feet and say so." *The Times* reports that the chairman said that while he would not criticise a document put out by a Ministry he disagreed profoundly with it. He also said, however, that the gas industry could provide a cooker which was safe for handicapped people, but the answer to the question of cheaply converting old ones on such lines was "No."

* * *

Mr. J. E. Hart, commercial engineer, North Eastern District, London Electricity Board, raises in *London Electricity* the question of the naming of the Board's local establishments. Although these are officially designated as "Electricity Service Centres," Mr. Hart says that the description has not caught on with the public who still refer to "showrooms" or "the electric place." He mentions that the South Eastern Board has stuck to the term "showrooms." Whether it matters or not, I am sure that Mr. Hart is right and that the public in general do not call them "Service Centres." And more often than not they refer to "the electricity company."

* * *

Horse racing is not a subject I know much about and so I was unaware, until I read it in *Aluminium News*, that at Newbury Racecourse there is now a running rail made of aluminium, which is something of an innovation. The rail is described as having a broad, flat surface and an integral lipped channel at the back for increased strength. The report modestly admits that the new rail may not offer patrons a better run for their money, but claims that it should give track owners a better run for theirs.

* * *

A great deal has been written about good writing: much of it I'm afraid on the failings of other people. I was pleased, therefore, to read in the magazine of Unilever—an excellent publication dealing with a wide variety of topics—an article which shows that the blame does not always rest with the authors. In presenting technical information the main aim should be to communicate ideas clearly and unambiguously, and in the fewest words consistent with this object. But failure to achieve this standard may arise from several causes. In the article in question Mr. B. C. Brookes, who is senior lecturer in the presentation of technical information in the Department of Electrical Engineering at University College, London, cites several cases to illustrate this point. In one, the authors were all graduate engineers and scientists whose practical work took them away from the office for two or three days on each job and their reappearance at the office was the signal that they were available for the next job. Mr. Brookes says that the manager who complained had apparently not realised that reports of the quality "he rightly demanded" required of their authors some detachment. The trouble was solved by providing a "sanctuary" in the office building, with no telephone, where the young scientists could work undisturbed.

* * *

Here is a tip for farmers from *Power* (New York):—

"Cows enjoying air conditioning and cooled drinking water during the summer grow faster than their uncooled comrades, AIEE has discovered."

* * *

A correspondent writes drawing attention to what he considers a serious shortcoming of the 13 A three-pin shuttered switched socket-outlet and associated plug. He says that his ten-month-old son recently "jiggled out the plug" connected to the floor standard sufficiently to enable him to touch the plug pins while they were still connected to the socket-outlet, the light being still on. I have already referred to this matter, but it seems to me that whatever one does to make the plug and socket completely safe there must always be some risk where a flex connection is concerned. My correspondent says that he "observed" the incident he refers to, and I cannot think that an energetic baby of such tender age as his would be left without maternal or paternal supervision.

* * *

The tenth annual dinner of the Institution of Electrical Engineers was reported in the *Electrical Review* of 9th December, 1898. The President, Mr. J. Wilson Swan (Sir Joseph Swan) was in the chair and in acknowledging the toast of the Institution, proposed by Sir Richard Webster, said that until quite a few years ago "electrical engineering" was of a negative kind, preventing electricity from doing mischief (he referred to lightning conductors). Now "electricity of Victorian times had been brought into subjection, and had been made a useful, obedient, and profitable servant." Nothing was said in the report about the menu but I imagine, having seen the bills of fare of contemporary dinners, that the Hotel Cecil (now long defunct) did the guests pretty well. But if they were not surfeited with food they must have been overwhelmed by oratory for beside the President's there were nine other speeches. The report concludes:—"and some time afterwards the proceedings terminated."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Lt.-Colonel A. E. Knights, D.S.O., M.C., M.M., A.M.I.E.E., A.M.I.Mech.E., the retiring manager of the Fens Sub-Area of the Eastern Electricity Board, has accepted an appointment as general manager and chief engineer to the Electricity Authority in Jamaica.

Lt.-Col. A. E. Knights

The Fens Local Committee of the Eastern Electricity Consultative Council recently entertained him to lunch in Cambridge. Mr. R. G. Curston, chairman of the Committee, presided and supporting him were Ald. W. J. Bennett, chairman of the Council, Mr. F. C. Orchard, manager-designate of the Fens Sub-Area, and Mr. P. Sydney, manager of the Suffolk Sub-Area of the Board and former commercial officer of the Fens Sub-Area.

Colonel Knights commenced his career in sailing ships on the Pacific run via Cape Horn but left the sea and became a pupil at the Great Yarmouth generating station. He served here as a junior charge engineer and technical assistant to the chief engineer and after a period at Southport became the borough electrical engineer at Bury St. Edmunds. In 1938 he transferred to the East Anglian Electric Supply Co. when that undertaking became responsible for the electricity supply in Bury St. Edmunds; on nationalisation of the industry he became manager of the Fens Sub-Area.

He served in the Norfolk Regiment in the 1914-18 war, attaining the rank of captain. In the last war he commanded the 4th Battalion of the Royal Norfolk Regiment, was captured at Singapore, and remained a prisoner until the end of the war.

At the anniversary meeting of the Royal Society held on 1st December **Sir Cyril Hinshelwood,** Dr. Lee's Professor of Chemistry at Oxford University, was re-elected president. Members of the Council elected include **Sir Christopher Hinton,** K.B.E., chairman of the Central Electricity Generating Board.

Awards of grants by the Paul Instrument Fund Committee have been made as follows:—£3,835 to **Professor A. L. Cullen,** Professor of Electrical Engineering at the University of Sheffield, for the construction of a detector in which radiation pressure is used to convert a microwave signal to an audio or intermediate frequency; £545 to **Dr. R. Feinberg,** of the Electrical Engineering Department, Manchester College of Science and Technology, for the construction of an instrument for measuring the intensity of soft X-radiation generated in experimental high voltage valves; and £1,000 to **Mr. R. M. Sillitto,** Lecturer in Natural Philosophy, University of Edinburgh, for the development of a 30-channel pulse-height analyser, using transistors in place of thermionic valves.

The annual general meeting of the North Metropolitan Branch of the **Electrical Industries Benevolent Association** will be held at Northmet House, Southgate, N.14, on Friday, 16th January (3 p.m.). Nominations for officers should be submitted to Mr. A. T. Durbridge, hon. secretary, Electricity Offices, 40, Church Street, Enfield, Middx., not later than 9th January.

Mr. G. G. Gouriet, M.I.E.E., head of the Television Department of the B.B.C. Research Group, has resigned to join the board of Wayne Kerr Laboratories, Chessington, Surrey. Mr. Gouriet was a United Kingdom delegate of Study Group XI of the Consultative Committee for International Radio, and has recently been elected a member of the Radio and Telecommunications Section Committee of the I.E.E. He has given the Fleming Memorial lectures to the Television Society on colour television and is the author of "An Introduction to Colour Television." Last month he gave a discourse at the Royal Institution on this subject.

Mr. G. G. Gouriet

Sir John Woods, G.C.B., and **Mr. Paul de Laszlo,** O.B.E., have been elected directors of Marconi's International Marine Communication Co., Ltd.

Mr. O. Howarth, M.I.E.E., has been appointed a director of Dennis Ferranti Meters, Ltd. Mr. Howarth's association with the electricity meter industry commenced with Ferranti, Ltd., and he later served with the Manchester Corporation Testing Department. In 1919 he joined the Lancashire Electric Power Co. as meter superintendent and was promoted to technical engineer. Before nationalisation he was also sales manager. In 1948 he was appointed chief engineer of the North Western Electricity Board, which position he held until his retirement in 1954. Mr. Howarth has served on various committees of the Institution of Electrical Engineers, the British Standards Institution and the Electrical Power Engineers' Association.

Mr. E. A. Beavis, B.Sc.(Eng.), A.C.G.I., M.I.E.E., chief engineer of the Power Cable Division of Siemens Edison Swan, Ltd., has retired after forty-five years at the Woolwich Works.

Mr. E. A. Beavis

Mr. Beavis joined the Rubber & Gutta Percha Co., Silvertown, as a temporary cable testing assistant on submarine telegraph cable projects in Australia and New Zealand. On his return early in 1913 he joined Siemens, Woolwich, in the Cable Testing Department, and was later in the Outside Contracts Department. There he worked on the electrification of the L. & S.W. Railway Suburban lines into Waterloo Station. About that time the manufacture of multiple twin trunk telephone cables was being undertaken at Woolwich and early in 1914 he was called back to the works to carry out testing and balancing requirements on these cables.

Following service in the 1914-18 war, Mr. Beavis was engaged on power and

The Queen dialling the number of the Lord Provost of Edinburgh during her visit last Friday to Bristol telephone exchange to inaugurate the new trunk dialling equipment *(see page 1109)*

trunk telephone cable installations in different parts of the country and in 1924 he joined the c.s. *Faraday* as assistant electrician for the Anglo-Dutch expedition. A new high voltage laboratory was erected at Woolwich in 1928 and Mr. Beavis took charge of routine testing of cables and was also responsible for the technique evolved in "super-tension" cable development, particularly H-type screened cable. He was concerned with the development of long lengths of submarine power cables, and the first of this type was laid at Penang, in Malaya. He was also associated with the design of Pluto, the oil carrying pipeline. After the war Mr. Beavis became associated with experimental gas compression cables up to 132 kV. During the last few years he has spent much of his time on the many problems affecting oil-filled cables. He was also one of the team which was responsible for the design of the experimental length of d.c. 100 kV cable constructed for the recent cross-Channel cable trials. Mr. Beavis was a technical editor of the *Siemens Engineering Bulletin* for many years. He has served on a number of committees, including those of the E.R.A. and the C.M.A.

Mr. E. Marland has been appointed commercial manager of the Capacitors and Resistors Division of the Plessey Co., Ltd., at Swindon. He joined the company in 1953 as a technical representative for the Aircraft Electrical Division and later became contracts manager and eventually sales and commercial manager of the Wiring Division. Before joining the Plessey Co. Mr. Marland spent fourteen years with the General Electric Co., Ltd., latterly as technical superintendent of the lamp works in Lancashire.

Mr. E. Marland

Mr. H. O. Jones, A.C.A., has resigned his position as secretary of Drake & Gorham (Contractors), Ltd., and **Mr. R. D. Bailey,** A.C.A., has succeeded him as secretary. Mr. Jones retains his position as joint managing director.

Recent Metropolitan - Vickers appointments include those of **Mr. E. W. Stainton,** B.Sc., A.C.G.I., A.M.I.E.E., as assistant sales manager, Switchgear Department; **Mr. D. R. Clegg,** Graduate I.E.E., as assistant sales manager, Transformer Department; **Mr. F. H. Davis,** M.Sc.(Met.), as assistant superintendent, Foundries; and **Mr. D. E. Thornhill,** B.Sc.Tech., as assistant superintendent, Transformer Department, Wythenshawe.

Mr. Stainton joined the Metropolitan-Vickers Co. in 1945 as a college apprentice, becoming switchgear projects engineer in 1950, and sales engineer in the Switchgear Sales Department in 1952, which position he held until his recent appointment.

Mr. Clegg, after a period as graduate trainee with the North Western Electricity Board, joined the company in 1951. A two-year period on the sales and engineering sides of the Transformer Department was followed by shorter periods in the Plant Department and the Switchgear Sales Department, after which he returned to the Transformer Sales Department as a sales engineer.

Mr. Davis joined Metropolitan-Vickers in 1944 as a member of the metallurgical section of the Research Department, and transferred to the foundry in 1957.

Mr. Thornhill joined the company as a vacation apprentice in 1936 and later became a junior engineer in the Instrument and Meter Department. In 1948 he transferred to M-V's subsidiary company, Newton Victor, Ltd., as development engineer at the Motherwell Works. Upon the formation of the new Electronics Department in 1955, combining the Radio Department with several other sections, Mr. Thornhill returned to the M-V Trafford Park Works as assistant superintendent, Electronics Department.

Mr. A. G. Revell, meter superintendent with the Eastern Electricity Board at Lowestoft, has retired after more than fifty years' service in the electricity supply industry, and he was recently presented with a television receiver by Mr. H. D. B. Wood, deputy chairman of the Board. The presentation ceremony was attended by Mr. C. N. Bancroft, manager of the Great Yarmouth and Lowestoft District, and Mr. J. R. Aldous, service manager, Lowestoft.

Mr. H. L. Hirchberg left by air for Australia on Monday last where he will take up a new appointment as director and works manager of the Ediswan-Ekco (CRT) Co., Sydney, New South Wales. For two years Mr. Hirchberg has been works manager of the Sunderland TV tube factories of Siemens Edison Swan, Ltd. He was previously division manager for five years in the former Marconi-Osram Valve Co., Ltd., factory at Team Valley, Gateshead.

The annual ball of the Tyne and Wear Area of the **Electrical Industries Benevolent Association** was held on 2nd December at the Old Assembly Rooms, Newcastle-on-Tyne, when Mr. A. J. Crawford (area chairman) and Mrs. Crawford, received 300 guests.

At the E.I.B.A. Newcastle ball. Left to right: Mr. and Mrs. T. Dellow and Mrs. and Mr. A. J. Crawford

Simms Motor & Electronics Corporation, Ltd., has appointed **Mr. A. Hess** as public relations manager.

Mr. A. Carr, assistant managing director of Thos. W. Ward, Ltd., Sheffield, has been appointed deputy chairman of the company. Mr. Carr joined the company in 1915 as a commercial apprentice and has been assistant managing director since 1954.

The president, Sir John Hacking, presided at the Christmas luncheon of the **Electrical Industries Club** last Tuesday. The guest speaker was Mr. J. E. S. Simon, Q.C., Financial Secretary to the Treasury, who surveyed the country's economic position as it was viewed by the Government. A collection on behalf of the older beneficiaries of the Electrical Industries Benevolent Association realised the sum of over £75.

Mr. M. Barnes, M.S.M.A., has joined the Simplex Electric Co., Ltd., as assistant sales manager, Household Appliances Department. He has been sales manager of the Domestic Appliances Department of Ferranti, Ltd., for the past two years and was previously a sales engineer in that department. During the war he served as a fighter pilot in the Royal Air Force.

Mr. M. Barnes

The National Committee of the **Electrical Industries National Golf Championship** held a meeting recently at the headquarters of the A.E.I. in Grosvenor Place, London. Lord Chandos presided and during the course of the proceedings he handed over to Dr. T. E. Allibone (president,

E.I.B.A.) a cheque for £3,400 from the proceeds of the various golf meetings held during the past year. Mr. Frank Farthing, who has been secretary of the Championship for six years, tendered his resignation, and Mr. L. Welch (London Electricity Board) agreed to take over the duties. Mr. H. V. Pugh (Eastern Electricity Board) and Mr. Farthing were appointed to the National Committee.

G. A. Harvey & Co. (London), Ltd., have recently made the following staff appointments:—**Mr. K. Tardif,** publicity manager, has now taken over the duties of home sales manager and will continue to operate from the company's head office at Greenwich. **Mr. H. Barker,** formerly deputy sales manager, has been appointed export sales manager and will also operate from Greenwich. **Mr. H. F. Jones** has been appointed London area manager controlling the company's London sales office at 58, Victoria Street, London, S.W.1.

Mr. W. A. Ives, who has been with A.E.I. member companies since 1925, is leaving this month for Southern Rhodesia to join Messrs. Chas. D. Burnell in Association with Viljoen & Keyter, consulting engineers, 506, Savoy House, Inez Terrace, Salisbury. Mr. Ives was last in Southern Rhodesia in 1957 when he carried out a market survey for B.T.H. and the A.E.I. Lamp & Lighting Co. After holding various positions with Siemens (1925-30), Ediswan (1930-35) and Harcourts (1935-40) Mr. Ives joined the Ministry of Supply to deal with lighting in war production factories and in 1942 he was seconded to the Government of India as essential services officer responsible for electrical and lighting installations in vital factories. He returned to India after the war to build up a lighting business for A.E.I. (India), Ltd., and was responsible for the first Indian fluorescent street lighting and cotton mill lighting. He is a founder member of the Illuminating Engineering Society of India and was its first treasurer.

Mr. W. A. Ives

Aberdare Cables, Ltd., held a cocktail party at the Savoy Hotel, London, on Monday last to celebrate their "coming-of-age." The guests were welcomed by Sir John Pascoe, the chairman, who was accompanied by a number of the directors. A souvenir booklet giving an illustrated history of the company was distributed.

The annual ladies' night of the **Association of Supervising Electrical Engineers** was held on 6th December at Park Lane Hotel, London. Mr. J. H. K. Pendry (chairman) presided and Sir Josiah Eccles (president) and Lady Eccles also attended. The toast to the ladies was proposed by Mr. Pendry, and Lady Eccles responded.

Lady Eccles speaking at the A.S.E.E. ladies' night. On her left are Mr. J. H. K. Pendry (chairman) and Mrs. Pendry

The annual dinner and cabaret of the **Telegraph Construction & Maintenance Co., Ltd.,** was held at Claridges on 5th December. Sir John Dean (chairman) presided and the principal guest, Mr. S. E. Goodall (President, I.E.E.), proposed the toast to the company, to which Sir John replied. Mr. C. L. G. Fairfield (director) proposed the health of the visitors and Mr. H. F. Hodgson (managing director, Joseph Sankey & Sons, Ltd.) responded.

On 4th December **Arrow Electric Switches, Ltd.,** entertained some 150 of their customers and friends to a cocktail party held at the Rembrandt Hotel, London, S.W.7. The guests were received by Mr. T. S. Crabtree, managing director, and Mr. B. C. Skinner, sales director, in company with their executive staff and their representatives from the London, Southern Counties, Birmingham and Lancs./Yorks. areas.

Mr. W. C. Kennett, B.Sc.(Hons.), M.I.E.E., A.M.I.C.E., M.S.E., is retiring on 31st December from executive duties with the Bryce Electric Construction Co., Ltd., after twenty-two years. He graduated in 1906 at University College, London, and holds its honours diploma. After four years as apprentice and draughtsman at Siemens Bros. Dynamo Works, Ltd., Stafford, he joined Johnson & Phillips, Ltd., later becoming chief transformer engineer. Early in 1920 he inaugurated the Hackbridge Electric Construction Co., Ltd., being manager for five years, thereafter technical director until 1936. He then joined the company now known as the Bryce Electric Construction Co., Ltd., to initiate the manufacture of transformers. From 1938 to 1942 he was also on the board of the Nevelin Electric, Ltd. He will continue with Bryce as consultant.

Mr. W. C. Kennett

Mr. H. S. Horsman, M.I.Mech.E., A.M.I.E.E., F.I.F., efficiency and testing engineer with the Central Electricity Generating Board, is retiring at the end of this year. Following the 1914-18 war he was employed by Babcock & Wilcox for a period of ten years and in this way he was initiated into power station work. He joined the London Power Co., Ltd., in 1930 and served seventeen years in the Construction Department. On nationalisation of the electricity supply industry he was appointed to his present position of efficiency and testing engineer. Mr. Horsman is a gold medallist of Liverpool University in respect of engineering research. He is also the holder of the Princess Elizabeth Silver Medal of the R.S.A. for a paper on district heating, and the Lowe Gray award of the Institution of Mechanical Engineers for a theoretical paper on heat engines and the Water Arbitration Prize for a recent paper dealing with the testing of power station plant. He is taking up work as a consultant with Messrs. Kennedy & Donkin.

OBITUARY

Mr. J. B. Feltham, M.I.E.E., died at his home in Long Eaton on 1st December. Mr. Feltham, who was seventy-seven, had a long connection with the electricity supply industry, having been appointed deputy city electrical engineer at Gloucester in 1907. After service at Mexborough he was appointed electrical engineer and manager of the Long Eaton U.D.C. undertaking in 1933, and on nationalisation he was appointed manager of the Long Eaton District of the East Midlands Electricity Board. Mr. Feltham retired from the service of the Board in March, 1951, but retained his interest in electricity matters through his membership of the District Joint Advisory Council as A.M.E.E. representative.

Mr. W. Shaw, who had been station superintendent, Bradford power station, since 1951, died on 1st December at the age of forty-six. Mr. Shaw joined Bradford Corporation as a power station assistant shift charge engineer in 1938. He held various power station appointments at Stuart Street, Fulham and Barking from 1946 until 1951, when he returned to Bradford as superintendent.

Sir James Myers, former principal of the Manchester College of Science and Technology and then director of the Manchester University School of Education, died on 5th December at the age of sixty-eight.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

An Architect's Approach to Floor Warming

ALTHOUGH I think everyone appreciates the point Mr. Baden Hellard makes about the simplicity and convenience that electric floor warming offers to the architect and builder, I feel attention must be drawn to the damage this type of heating may do to the electrical industry.

Since the war, there have been several waves of public enthusiasm for what were, to the general public, innovations in heating. Firstly, the public discovered district heating and, before that had died down, a good many engineers had spent a lot of time explaining why it was not really so practical as it might appear on the surface. In spite of this, quite a number of installations did go ahead and one can only think that many of them were not really successful as nothing is heard of these schemes today. Secondly, there was a good deal of talk about reversed heat engines and great things were expected from this method of keeping ourselves warm, until the real facts became plain to engineers in general.

Of course there are applications for district heating and applications for reversed heat engines, but it was a great mistake to let the public run away with the idea that wonders could be performed by these methods, and I feel that exactly the same reasoning applies to electric floor warming, only in this case it may do a good deal of harm to the electrical industry.

Mr. Baden Hellard produces some very good arguments and interesting comparisons of all-in costs, which are all very well when you want a building heated 24 hours of the day. For people who want 6, 8 or 10 hours' heating a day, the costs will be found very high and electricity in general will be blamed and not the method of heating that has been adopted.

Mr. Baden Hellard has mentioned a block of flats, which would appear to be three-roomed apartments, with a loading of 4·6 kW, for heating. I believe the consumption for a 210-day heating season will be at least 6,900 kWh and, taking an off-peak domestic tariff of 0·9d, this will cost £26. The alternative in such flats would surely be to have electric convectors, fires or other forms of direct heating with a loading not exceeding 4 kW, and if all three rooms were heated 15 hours per day for the same period, the electricity consumption should not exceed 5,000 kWh, which again, on an on-peak domestic tariff of 1¼d, would also cost £26 per annum and, incidentally, a good deal less to install. With the latter scheme, however, the tenants would have control of the temperatures in the different rooms and the hours they chose to have them heated, fully or partially, and they could reduce their heating costs to much less than about £1 a week which floor warming would cost them.

Coming now to large buildings, such as factories, office blocks, etc., the vast majority of which are in occupation for only 8 hours a day, it has been found from experience with a great number of buildings that the heat requirement for 8-hour occupation, plus the pre-heating time, is 58 per cent of the heat requirement of the same building kept up to temperature for 24 hours. This comparison assumes that the same form of heating is used in both cases, but with the edge losses from heated floors, it is probably quite safe to say that warming a building for 8 hours a day requires only half the electricity which would be needed to warm it for 24 hours a day with floor warming.

It is not possible to get a rate of 1¼d/kWh for continuous heating of industrial buildings, so that the future of electric heating of such buildings must surely be by methods of heat storage which can be controlled to liberate heat when it is wanted. This, of course, has been done electrically in this country for more than 30 years, using water as the storage medium and any of the conventional forms of heating system.

Mr. Baden Hellard makes the point that electric floor warming does not take up any useful space and it is unfortunately true that with most Area Board tariffs, fairly large hot water storage cylinders have to be incorporated in the basement for this form of heating. A notable exception is the South of Scotland Electricity Board, who have one tariff where the peak periods are so short that the heat storage in the pipes and radiators is sufficient to carry through.

Even with the disadvantage of having to provide space for thermal storage, surely architects would be wiser to consider its use more fully than taking the easy course of adopting buried wires and letting the customer face an annual bill of twice the amount he need have done if he had given up a little space to a storage vessel.

Harrow, Middx.

S. A. WILLIAMS,
Managing Director,
Bastian & Allen, Ltd.

Building Construction and Space Heating

MR. OSBORNE'S letter in your issue of 5th December was very disappointing. So little is known about economical, thermally efficient forms of domestic building construction, and his letters contribute little in this respect.

It was this general lack of available knowledge which first caused me to search out the information for myself. At that time, my colleagues included many qualified architects, civil engineers and surveyors, and these freely admitted that suitable methods were just not available. May I hasten to add, however, that they were most generous with advice and comment.

Regarding the content of Mr. Osborne's letter, his so-called "facts" still seem confused. He refers to hollow clay "facing" blocks by the London Brick Co., and yet says they are "all grooved for plastering." He confesses that neither he nor his colleagues were aware of, nor would recommend their use externally unless rendered, and supports this attitude by quoting it as standard practice on the Continent; yet his previous letter deplored this practice. He describes my statement that rendering is not essential as a "wild *non sequitur*," and cannot believe that I really mean it, but I do, of course, although I must point out that I made no comment on the merits of such a practice.

In support of my attitude may I mention on good authority, although I have not had time to verify it, that the Building Research Station have photographs of Continental practice in unrendered, hollow clay block, external walling, and I understand that examples of such a practice can be found in the London area. A building industry publication dated January, 1957, carried an article on this practice using London Brick Co. blocks.

I fully agree with Mr. Osborne's remarks on comfort and "U" value, but it is obvious that the higher the "U"

value, the more economical it will be to achieve comfort conditions, however one interprets the word "comfort." This, incidentally, was the essence of my article. Finally, in the absence of recording instruments, which I have, disappointingly, been unable to beg, borrow or steal, I am keeping temperature and consumption figures and would be delighted to discuss these with Mr. Osborne if he cares to get into touch with me.

Buckfast, Devon. R. I. ELLARBY, A.M.I.E.E.

Hire-Purchase Terms

SIR IAN HOROBIN, Parliamentary Secretary of the Ministry of Power, speaking at a Press conference at Bristol on 21st November, spoke of people "coming in hordes and droves to buy on hire purchase" and of the danger of "raging inflation."

It is difficult to reconcile the attitude of the nationalised electricity supply industry with the Government's concern. For example, at the present time the Eastern Electricity Board is offering electrical appliances on terms of 5 per cent down and *four* years to pay. Other Area Boards offer 10 per cent down and *five* years to pay. This contrasts with the terms recommended by various trade associations to the electrical trade which, in general, are a minimum deposit of 10 per cent and *two* years to pay.

Surely, the national undertaking should not be permitted to offer terms which are not an economic proposition and which would appear to encourage the inflationary conditions about which Sir Ian is rightly concerned.

FAIR PLAY.

Electronics in the Steelworks

I FEEL that I should reply to Mr. Bamford's letter in your issue of 5th December in which he comments on my omission of a description of the fluorite polychromator and my use of the term "new vacuum techniques" in connection with the problem of the spectrographic analysis of carbon and sulphur in steel.

Firstly, although my article was not published until November, it was written before the polychromator was installed in March. Secondly, this instrument is one of the first, if not the first, of its type to be used for steel production control in Europe. It seems logical, therefore, to describe the vacuum techniques as new in connection with production control spectrographs used in the steel industry in this country. Mr. Bamford is, of course, correct in stating that vacuum spectrography is far from being a new subject but, nevertheless, site development work lasting until October was required before this instrument could be used on a continuous shift basis.

Port Talbot, Glam. J. K. EDWARDS,
Automation Engineer,
Steel Company of Wales, Ltd.

German Retailers' Visit

MEMBERS of the West German retail trade mission which toured the United Kingdom last week to examine British consumer goods expressed the views that the British consumer goods industries were go-ahead, efficient and keen on exporting to West Germany, and that the visit had produced very good possibilities of increased trade between the two countries.

The mission consisted of directors of large retail and departmental stores in West Germany. They came at the joint invitation of the Government and the Federation of British Industries as part of an officially inspired campaign to increase our exports to West Germany. West German purchases of British goods rose from £97 million in 1957 to an annual rate of £130 million in the third quarter of 1958, but so far this year these rates have been exceeded by German exports to the United Kingdom. British exports of electrical appliances to Germany in 1957 were:—Washing machines £923,100; vacuum cleaners and parts £134,000; thermo-controlled irons £44,600; toasters £26,400; food mixers £94,800; and dry shavers £98,800.

British cookers, the mission thought, were extremely well finished and technically in advance of those made anywhere in Europe, including Germany. Styling and design of both cookers and refrigerators were generally acceptable to the German buyer except that the *hausfrau* preferred a solid boiling ring to a radiant ring. With larger electrical appliances where a spare parts service is important, the mission thought it would be best for the industries of the two countries to get together. Generally, however, members of the mission were mostly interested in the items stocked as a matter of course in their retail stores, such as food mixers, toasters, hair dryers, percolators, and dry shavers.

The party visited the London Electricity Board's showrooms in Regent Street; they were accompanied by Mr. W. J. Sageman, the manager of the Board's West End District, and by members of the B.E.A.M.A. staff.

European Free Trade

SINCE the meetings of the Maudling Committee of the Organisation for European Economic Co-operation were suspended the initiative seems largely to have passed to the six Common Market countries. They have shown themselves solidly opposed to any early resumption of negotiations to establish a Free Trade Area to go forward with the Common Market from 1st January and they have, in fact, directed that Professor Hallstein, chairman of the European Economic Commission, should make an inquiry, and report before 1st March, on the main problems and the chances of finding solutions for them. This would appear to be a direct challenge to the O.E.E.C. Council of Ministers, which specifically appointed the Maudling Committee as the body through which negotiations should be carried on, and it will no doubt be a principal point of discussion along with the likelihood of political and economic discrimination among its members when the Council meets next week.

Professor Erhard, West German Minister of Economic Affairs and President of the Council of Ministers of the European Economic Community, visited London last week to inform the British Government of the decision of the "Six" to offer concessions that will mitigate the discrimination that will arise in European trade after 1st January; and a method of negotiating a "multilateral association" between the "Six" and the remaining eleven O.E.E.C. countries. It is proposed that as an interim arrangement the "Six" should extend the 10 per cent cut in tariffs to be introduced on 1st January to all members of O.E.E.C., and of the General Agreement on Tariffs and Trade and all countries which profit from a "most-favoured-nation clause." Although no reciprocity is asked for on tariffs, it will be a condition of the extension of the 20 per cent increase in quotas to O.E.E.C. countries outside the Common Market.

Discrimination it seems will occur in at least two directions. The countries outside the Common Market will not benefit from the lower tariff in countries such as the Benelux group whose external tariff is already lower than the Common Market tariff. The small import quotas of Italy and France will be increased to a minimum of 3 per cent of production towards Common Market countries but by only 20 per cent towards the rest.

Mr. R. Maudling, speaking at Torquay on Saturday, said Britain sought a multilateral, non-discriminatory association with the "Six" that would neither damage the unity of Europe nor impede the working out of the Treaty of Rome. He believed that within the Free Trade Area framework provisions could be made to meet the special difficulties some countries had in mind.

PARLIAMENTARY REPORT

Nuclear Installation Licensing

Labour peers challenged the whole principle of the Nuclear Installations (Licensing and Insurance) Bill when it reached its committee stage in the House of Lords. Their first amendment, which sought to ensure that the Minister would grant licences for the erection of nuclear reactors only after consultation with the Atomic Energy Authority, was really an attempt to bring the Bill into line with the Atomic Energy Act, 1954.

Replying to the debate, the Minister of Power (Lord Mills) said he could not understand why the purpose of the Bill was not understood. At present any person could operate a nuclear reactor without a licence, apart from the ordinary patent licence for construction from the Atomic Energy Authority. The whole purpose of the Bill was to institute licences for safety reasons, and to enable the Minister to set up an inspectorate to ensure that proper conditions were laid down and followed.

The amendment was defeated by 69 votes to 31.

Lord Latham proposed an amendment to provide that before the Minister granted a licence for a reactor he should advise or consult with the water undertakings which might be affected by the discharge of radioactive waste.

Lord Mills said that the arrangements for authorising the disposal of waste in the 1954 Act were temporary and the Ministry of Housing was about to enter into consultations with the British Waterworks Association and other associations of local bodies about permanent arrangements for the disposal of waste from all sources. It would not be proper for him to accept the amendment while those discussions were in progress.

The amendment was withdrawn.

Another Opposition amendment sought to ensure that the Minister, in granting a licence, would make it a condition that there should be no material change in the constitution or control of the company without his consent. Lord Mills said he would consider this point before the report stage.

Lord Taylor moved an amendment to remove the ten-year limit on claims for damage to persons or property.

Lord Mills said he was not without sympathy with the proposition but he had to take account of the fact that the amendment would put an unlimited liability in time on the licensees and insurers. Insurers needed to know for how long reserves must be set aside to meet contingent liabilities. A ten-year period was favoured by other member countries of O.E.E.C. and was likely to be adopted for a European convention. After further debate, however, Lord Hailsham, Lord President of the Council, promised that the Government would consider the matter again before the report stage, and the amendment was then withdrawn.

Lord Silkin moved an amendment allowing the Government to undertake the liability for claims for damage and to seek reimbursement from the licensee. Lord Mills opposed it because he said it gave the licensee no indication of what his liability might be, but, after further debate, he promised to re-examine the proposal.

The committee stage was concluded although one important amendment was not dealt with. It was agreed to debate this at a later stage.

Oil for Power Stations

During a debate on the Coal Industry Nationalisation (Borrowing Powers) Order, Mr. A. M. F. Palmer said that in view of the surplus of small coal the Minister of Power should cause power stations with oil firing to revert to coal firing. Railways and local authorities should concentrate on electrification and avoid the use of oil. There might also be a case for re-phasing and revising the nuclear power programme until the situation improved.

In winding up the debate, Mr. R. Maudling (Paymaster General) said that the possible reduction of the supply of oil under contract to power stations had been discussed with the oil industry which had been very co-operative. To go further would be unfair.

"Kite Mark" Schemes

Miss Burton asked the President of the Board of Trade whether he was aware of the anxiety felt by the British Standards Institution at the slow progress made in its desired arrangements for marking electrical equipment as safe when this complied with certain standards; and, as the Institution received a grant for this from the Government, what proposals he had to make for expediting such work.

Mr. John Rodgers, Parliamentary Secretary, said the fact that the Board of Trade made a grant to the British Standards Institution did not entitle the President to direct its work on matters of this kind. Some firms were showing an interest in the extension of the "Kite Mark" scheme to new ranges of domestic electrical appliances.

Miss Burton said that the last report of the B.S.I. Advisory Council stated that the scheme for electrical goods was in an advanced state of preparation in October, 1957.

Mr. Rodgers replied that the present B.S.I. "Kite Mark" scheme did cover some electrical appliances, such as electric lamps and blankets, and there were other schemes which covered electrical appliances not applicable to domestic consumers. But manufacturers had also been making inquiries about "Kite Mark" schemes for electric dry shavers, fires and irons.

Hire-Purchase and Inflation

Mr. Palmer said that on 21st November Sir Ian Horobin, Parliamentary Secretary, Ministry of Power, had stated in Bristol that people were coming "in hordes and droves" to buy on hire-purchase. According to a newspaper report he had said that if we kept up this hire purchase for any length of time we should be back into raging inflation. But Sir Ian had added that he did not think that raging inflation would return—unrestricted hire-purchase would be dropped before that happened. Did that statement represent Government policy or was it not to be taken too seriously?

Mr. Rodgers said Mr. Palmer might also have pointed out that Sir Ian had said that unlimited finance from public funds could not necessarily be guaranteed and the amount of additional finance, if any, was a subject for the Chancellor of the Exchequer.

Mr. Lipton asked how much was now outstanding in respect of hire-purchase and other credit instalments.

Mr. Rodgers replied that the latest published estimate of hire-purchase and other credit instalments outstanding for durable goods was £515 million at the end of September. It was provisionally estimated that payments outstanding rose by about 2 per cent during October.

British Aluminium

Mr. Heathcoat Amory, Chancellor of the Exchequer, told Mr. Harold Wilson that application had been made to the Treasury for consent to proposals affecting the future capitalisation and ownership of the British Aluminium Company, and it was under consideration. Mr. Wilson asked him to consider the important issues involved without hurry, and to see that the issues were properly investigated.

Tax on Heat Pumps

Mr. Albu asked the Chancellor of the Exchequer whether he would have an examination made of the fuel-saving properties of the domestic heat pump, with a view to reconsideration of the present purchase tax on these appliances.

Mr. Amory said he was aware of these properties, but it would not be right to single heat pumps out for a fiscal privilege over competitive kinds of electric heater or refrigerator.

INDUSTRIAL NEWS

Brussels Exhibition Awards

The fifteen awards won by the British electrical and allied industry at the 1958 Brussels World Exhibition were presented by the Belgian Ambassador at a ceremony in London on 10th December. The exhibit was a collective one organised by the British Electrical and Allied Manufacturers' Association, with the support of the British Radio Equipment Manufacturers' Association, the Cable Makers' Association, the Electric Light Fittings Association, the Electronic Engineering Association, the Telecommunication Engineering and Manufacturing Association, and the Water-Tube Boilermakers' Association, together with 160 individual firms.

Electrical Contracting Agreements

We have received from the National Federated Electrical Association, 14, Bedford Row, London, W.C.1, a copy of the 1958 edition of its 91-page booklet containing the full details of industrial agreements and national working rules as agreed between the N.F.E.A. and the Electrical Trades Union.

While the booklet is primarily designed for electrical contractors, it is of equal value to all concerned with the placing of electrical installation work—architects, surveyors, builders, local authorities, Government Departments, etc. Copies are available from the Association at 4s each, including postage.

Brighton Power Convention

The bound volume of the proceedings of the tenth British Electrical Power Convenion held at Brighton last June is now available. It contains a portrait of the president, Sir George Nelson, as well as his address, the Convention papers and discussions (including the "Electrical Forum") and a list of the delegates and visitors. The proceedings are being sent to delegates but extra copies are available at 30s each from the Secretary, B.E.P.C., 26-27, Cockspur Street, London, S.W.1.

Iron and Steel Scrap Export Licence

In agreement with the Ministry of Power, the Board of Trade has announced the issue of an open general licence permitting the export to any destination during the period 5th December to 4th February of iron and steel scrap not exceeding an f.o.b. value of £25 per ton. The licence specifically excludes material derived from armour plate or from military equipment described in Group 17 of the Export Control Order. The open general licence will not be extended and exports arranged for shipment after its expiry date will not be permitted. Inquiries about this licence should be made to the Board of Trade, Export Licensing Branch, Gavrelle House, Bunhill Row, London, E.C.1 (telephone: Monarch 4071). Copies of the open general licence (price 2d each) can be obtained from H.M. Stationery Office, Kingsway, London, W.C.2, and branches.

Centenary Museum

A museum has recently been opened at the Woolwich works of Siemens Edison Swan, Ltd. The exhibits deal with the lives and scientific achievements of Carl Wilhelm Siemens, Thomas Alva Edison and Joseph Wilson Swan. In addition, documents and original apparatus cover 100 years of telegraphy, telephony, power engineering and illumination. The company says it would welcome visits, by appointment, of both individuals and small parties.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £219 10s 0d
Fire Refined 99·70%	ton £218 0s 0d
Fire Refined 99·50%	ton £217 0s 0d
COPPER Tubes ..	lb 2s 1½d
Sheet	ton £248 10s 0d
H.C. wire and strip ..	ton £270 15s 0d
LEAD, English ..	ton £72 10s 0d
Foreign	ton £71 0s 0d
MERCURY	flask £74 0s 0d
TIN, block (English) ..	ton £757 10s 0d
ZINC, G.O.B. Foreign	ton £72 15s 0d
BRASS Tubes (solid drawn)	lb 1s 8⅞d
Wire	lb 2s 6⅝d
PHOSPHOR BRONZE Wire	lb 3s 11½d
PLATINUM	oz £19 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 24¼d—24⅜d

New L.E.B. Service Centres

Two new Electricity Service Centres have been opened by the London Electricity Board during the past fortnight—one, for the North Western District, at 245-247, Finchley Road, N.W., and the other, for the Western District, at 154, Uxbridge Road, Shepherds Bush, W.12.

The Finchley premises, opened on Monday of this week, have a total showroom floor area of approximately 2,000 sq ft, spaciously laid out with all the usual items of domestic electrical equipment. There is a well-equipped demonstration kitchen, and although there is no fixed demonstration area, approximately a quarter of the showroom space can be screened off by curtains when required for cookery demonstrations, film shows, lectures, etc.

Heating of the main showrooms is by "Thermodare" night storage heaters and the total heating load is in the region of 40 kW. A pleasing lighting effect is obtained by the use of an illuminated ceiling and for this purpose Crompton "Modulume" ceiling lighting fittings are employed. The lighting load totals 7·7 kW. Excellent use is made of the window space and here "Atlas" blended window lighting fittings are installed. Above the all-glass entrance doors eight 125 W Philips infra-red lamps are fixed, which, in addition to providing a decorative effect to the porch area, also give a "warm welcome" to all users of the Centre. The premises are under the supervision of Mr. P. J. Beer, who is assisted by a staff of six.

The Service Centre at Shepherds Bush was opened on 2nd December. It has been built on the site of the previous one which was completely demolished by enemy action in 1940, since when use has been made of temporary premises three doors away.

Plant for New Zealand Airports

Nine "no-break" generating plants and associated control gear are being supplied by Pelapone Engines, Ltd., to the New Zealand Government for installation at airports throughout the country.

Sign Design Competition

The judges for the illuminated sign design competition which is being sponsored by the Electrical Sign Manufacturers' Association (particulars were given in our issue of 28th November) have now been announced. They will be: Professor Sir William Holford, F.R.I.B.A., professor of town planning, University College, London, Sir Herbert Manzoni, C.B.E., city engineer and surveyor of Birmingham, Sir Miles Thomas, D.F.C., M.I.Mech.E., chairman of Monsanto Chemicals, Ltd., Mr. U. A. Coats, B.Arch., F.R.I.B.A., county planning officer, Lancashire, and Mr. K. J. Oldham and Mr. G. S. Campbell, chairman and vice-chairman respectively of the Electrical Sign Manufacturers' Association.

Census of Production

The Census of Production for 1959, to be taken in 1960, will be the first of a series of simple annual censuses for the years between the detailed census for 1958 and the next detailed census. Arrangements for the 1959 census, which have been settled after consultation with the Census of Production Advisory Committee, incorporate two important changes which will simplify the census still further.

These changes concern the information required, and the unit to which the returns will relate. The 1959 census will cover the industries in Orders II-XVIII of the new edition of the Standard Industrial Classification, as in 1958. These are mining and quarrying, manufacturing, construction, and the gas, electricity and water supply industries. Returns will be required from all firms in this field employing 25 or more persons, with the exception that those contributing to the Board's quarterly inquiries into stocks and capital expenditure will be exempted. The questions asked will be fewer than in any previous census, covering the following three items only: Total value of goods sold and work done; stocks; and capital expenditure. Copies of the questions to be included in the census forms are available on request from the Census Office, Lime Grove, Eastcote, Ruislip, Middx.

Heavy Loads on Preston By-pass

It will be recalled that objections were made by B.E.A.M.A. and other organisations to the proposal that heavy indivisible loads should be banned from the new motorways. Now the Minister of Transport and Civil Aviation has made regulations for the Preston By-pass Motorway in which this point is dealt with. Regulation 13(3)(*b*) empowers the Lancashire police authorities to authorise the use of the motorway "on occasion or in emergency" by "(i) motor vehicles and trailers the use of which for or in connection with the conveyance of abnormal indivisible loads is authorised by an order made by the Minister under paragraph (*b*) of the proviso to subsection (1) of section 3 of the Road Traffic Act, 1930, or (ii) heavy and light locomotives when being used for or in connection with the conveyance of abnormal indivisible loads."

New Atlas Manchester Showrooms

New showrooms for Atlas Lighting, Ltd., were opened at Thorn House, Derby Street, Cheetham, Manchester, on 2nd December. The new showrooms are extensive and display a comprehensive selection of the wide range of lighting equipment for industrial, commercial and domestic lighting. The Manchester area manager is Mr. F. Roberts.

The new Manchester showrooms of Atlas Lighting, Ltd.

Sir John Pascoe, chairman of South Wales Switchgear, Ltd. (centre) and Mr. A. J. Nicholas, managing director (on his right) with apprentices from Scotland who are undergoing training at the Blackwood Works before returning to the company's Scottish factory

Thermal Storage Water Heaters

In our survey on thermal storage water heaters published in last week's issue the Heatrae F.B., R.B. and R.B.F. ranges of water heaters were incorrectly described as non-pressure types; they are cistern type water heaters. It has since been announced by Heatrae, Ltd., that the prices of types F.B. and R.B. water heaters have been reduced. The new prices are as follows:—5 gal, £27 7s 6d plus £6 8s 1d purchase tax; 12 gal, £36 7s 6d plus £8 10s 3d; 15 gal, £40 11s 6d plus £9 9s 11d; 20 gal, £47 12s 6d plus £11 2s 11d; 30 gal, £55 11s 6d plus £13 0s 1d.

"Data Processing"

The operation and success of a modern business depends very largely on the collection and proper handling of information. This involves not only systems of filing but the interpretation of the matter filed so that the management can ascertain the situation in any department of the business and quickly make the necessary adjustments.

A new quarterly publication, "Data Processing," designed for top management and chief executives, makes its appearance next month. It will cover the whole range of automatic aids to good commercial and industrial administration and methods of evaluating the information obtained. The first issue will include articles on the operation of digital computers, automatic programming, industrial inspection, wage accounting and labour costing, the high-speed printing of computer outputs and automatic reading equipment for serving computers.

The new quarterly is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. The subscription is £4 (or $12) a year or £8 ($24) for three years.

Wolf Electric Tools in India

Two years ago Wolf Electric Tools, Ltd., joined forces with its Indian agents, Rallis India, Ltd., for the assembly of a limited range of Wolf electric tools in India. A new company, Ralliwolf Private, Ltd., has now been registered and a freehold site at Mulund, near Bombay, has been acquired, where the erection of a factory is now under way. These facilities will enable manufacturing processes to be progressively undertaken and the existing range of Indian produced Wolf tools to be extended. By 1962 it is estimated that the tools will be manufactured almost entirely from local resources.

Proton Synchrotron Contract

A 7,000 MeV proton synchrotron is being built for the National Institute for Research in Nuclear Science by the United Kingdom Atomic Energy Authority at the Rutherford High Energy Laboratory, Harwell. Contracts have just been placed for the electrical equipment which will supply power to the magnet. The British Brown-Boveri Co., Ltd., are to supply over £500,000 worth of convertor plant while the English Electric Co., Ltd., is to provide the rotating machinery at a cost of over £470,000.

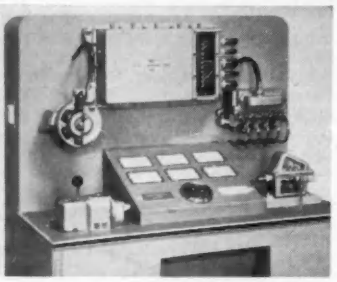
The purpose of this equipment is to supply accurately regulated pulses of power to the windings of the eight sections of the synchrotron's 7,000-ton ring shaped electromagnet, to keep the protons in their path as they are accelerated. About 35 million jules energy has to be converted from stored energy for flywheels to field energy in the magnet at a controlled rate during 0·75 sec while the protons are being accelerated, and then returned to the flywheels for about

a second until the next pulse. The rotating machinery consists principally of two large motor-alternator-flywheel sets mechanically coupled together. The power fed in by the motors to keep the process going is 10,000 h.p. The convertor plant includes excitrons, which are large mercury vapour switches, timing and control equipment and transformers.

Automatic Gear Change Control

A fully automatic electrically operated transmission control system has been developed by C.A.V., Ltd., for commercial vehicles and is primarily intended for use on vehicles fitted with direct acting epicyclic gearboxes. The system has been designed initially for the electro-pneumatic system of gearbox actuation, but it could be adapted for hydraulic systems.

Selection of the correct gear to suit each set of operating conditions is achieved by the resolution of two electrical signals in a control unit. One signal, obtained from a small alternator mounted on the gearbox, is proportional to the vehicle speed and the other, varied by an accelerator pedal switch, provides an indication of the torque required. The two signals obtained from the speed-sensitive alternator and the accelerator switch are integrated on sensitive relays, each



Demonstration console for C.A.V. fully automatic gear change control. The control unit is shown at the top centre. The selector switch is below the speed-sensitive alternator at the left and the accelerator switch is shown below the electro-pneumatic valve unit at the right

of which controls a gear change. By a suitable combination of signals, the appropriate relays will operate and energise interlock switching relays. These latter units permit current to flow to the appropriate gear solenoid in the electro-pneumatic valve block which allows the gear to be selected.

Tape Recorder Manufacture

The offices and factory of Grundig (Great Britain), Ltd., were moved in July last from Kidbrooke Park to new and larger premises at Sydenham, where the 42,000 sq ft of factory space available leaves ample room for further expansion. The technical department now has its own drawing office and laboratory. A total of 250 people are employed at the new offices and works.

All new tape recorders received from Germany are dismantled on arrival. The frequency response, which had been set for dictating purposes only, is altered for a wider range of applications and each machine is subjected to thorough electrical and mechanical tests. About 10,000 recorders of all types pass through the factory per month and any repairs or adjustments to them are carried out before dispatch. The factory has a separate service department and deals with 30,000 recorders per annum.

Tape recorder test line at the new Sydenham factory of Grundig (Great Britain), Ltd.

Grundig's radio factory is scheduled to move from Walthamstow to Sydenham early next year.

Power Engineers' Pay Claim

Mr. H. Norton, general secretary of the Electrical Power Engineers' Association, states in the Association's journal that at a meeting of the National Joint Board for the Electricity Supply Industry on 18th November the Association asked for an increase of 4 per cent in all N.J.B. schedule salaries. It also proposed that there should be a specified minimum entry salary with specified minimum increments.

South African Telecommunication Factory

To meet the demands of the continuously expanding telecommunications network in South Africa a factory for the manufacture of automatic telephone exchange equipment and telephones, owned jointly by Automatic Telephones (S.A.), Ltd., and Siemens Edison Swan (Pty.), Ltd., both of Johannesburg, was opened on 20th November at Springs, Transvaal. Some 31,500 sq ft of covered floor area will be erected on a 13 acre site with existing buildings covering approximately 20,000 sq ft. About £1 million will be invested in the next few years.

Power Station Pumping Plant

The new base load power stations to be built for the C.E.G.B. at Thorpe Marsh and Blyth will incorporate glandless motor pumps larger than any so far operating in Europe. Ordered from Hayward Tyler & Co., a member of the Stone-Platt group, for operation at system pressures approaching 3,000 p.s.i.g., these units will be used for the forced circulation of the boiler water through the water tube system. Within three years orders for forty-two of these high pressure glandless motor pumps, ranging from 240 to 500 b.h.p., have been placed with Hayward Tyler for new power stations in the United Kingdom, Canada and France, the total value amounting to some £360,000.

Brookhirst-Igranic Merger

Metal Industries, Ltd., announces further steps in the closer association of its two electrical subsidiaries, Brookhirst Switchgear, Ltd., Chester, and the Igranic Electric Co., Bedford. A new company, Brookhirst Igranic, Ltd., has been formed with Sir Charles Westlake (chairman of Metal Industries) as chairman; other members of the board are Mr. J. Black (deputy chairman), Mr. H. O. Houchen (managing director), Mr. J. O. Knowles and Mr. W. Padley. Principal executives of the new company, under Mr. Houchen, are: Mr. G. H. M. Houston, director of sales and contracts; Mr. T. D. Turner, director of production; Mr. N. Clarke, secretary; Mr. C. Payne, chief accountant; Mr. A. W. Page, sales manager; and Dr. J. N. Fletcher, leader of research. Mr. D. W. Kent will remain general manager of Igranic; the general manager of Brookhirst will be Mr. R. H. Mercer.

Revo Cooker Campaign

In launching its new "Revo-Luxe" cooker, the Revo Electric Co., Ltd., has given over forty demonstrations to the personnel of Electricity Boards and electrical retailers throughout the country. The presentation in London took place recently in the Connaught Rooms with 750 people present. The sales campaign is being backed by national advertising and "spots" on commercial television.

British Power Plant for South Africa

For the first section of their new Rooiwal power station, the Pretoria City Council has placed contracts with the English Electric Co. of South Africa for two 60 MW turbo-alternators and with Yarrow (Africa) (Pty.), Ltd., for two 550,000 lb/hr pulverised fuel fired boilers. The value of these contracts is about

£2,800,000 and the major part of the equipment will be supplied from this country. Messrs. Merz & McLellan are the consulting engineers for the Council, who will shortly be placing further contracts for associated equipment for the Rooiwal station.

Tractor Demonstration

A demonstration of automatic tractor control using a wire laid on the ground energised with low voltage a.c. was staged jointly by the Farm Mechanisation Department of Reading University and the Rural Electrification Section of the Electrical Research Association at the University Farm, Sonning, Berkshire, last Thursday. Two search coils are mounted at the front of the tractor and are in circuit with the relay which controls the solenoid-operated hydraulic valves. These, in turn, control the steering of the tractor. If the tractor veers to one side of the ground wire, an out-of-balance current flows in the search coils which operates the relay to correct the steering. The tractor can be made to stop, raise an implement, etc., by sending appropriate signals along the ground wire.

This control system is not considered suitable for all types of field work but it can replace the driver for routine carting operations over regular routes. It is relatively cheap and robust, easily installed and has negligible running costs. The design and installation of the electrical equipment was carried out by the Electrical Research Association and the University of Reading.

Economy in Billet Heating

A unit incorporating dual-frequency heating has recently been installed by Birlec, Ltd., at Forgings & Presswork, Ltd. It employs mains frequency power for pre-heating the billets to 700 deg C and high frequency (at 3 kc/s) for final heating to forging temperature. Thus the required high-frequency generator capacity is halved, with substantial savings in capital and running costs. Rapid heating ensures that scaling is reduced to the minimum.

The total rating is 400 kW; half the power is applied direct from the 50 c/s supply and half from a B.T.H. motor alternator. The installation is capable of heating one ton of steel billets per hour, though the output is adjustable down to 7 cwt/hour. Interchangeable heating coils provide for the heating of various sizes of billet, up to 4in square and 12in long.

The unit has twin horizontal tracks, each equipped with dual-frequency heating coils. The billets are loaded on to an elevator magazine and their progression through the heater is fully automatic. Upon discharge from the high-frequency coil, billets are delivered by gravity feed down chutes to the forging press. The loading magazines are provided with space for a ten-minute supply of work and are equipped with two sets of limit switches. The first actuates an alarm when the loaded magazine is becoming depleted. After a further interval, should there still be no delivery of billets to the magazine, the second switch trips off all power. There is thus no danger of overheating residual billets in the coils.

Locomotives for East Africa

East African Railways and Harbours is placing an additional order for two 1 Co-Co 1 1,840 h.p. diesel-electric locomotives with the English Electric Co., Ltd. This follows the order for eight similar locomotives awarded to the company in August last. The locomotives will go into service between Mombasa, Nairobi and Kampala.

Regent Street Christmas Lighting

In our last issue we published a picture of the Christmas lighting decorations in Regent Street, London. The General Electric Co., Ltd., tells us that the lanterns are lit by 7,000 Osram 300 W lamps. The scheme was designed by Beverley Pick Associates and installed by the London Electricity Board.

Electricity in Walsall Flats

The first block of three eight-storey blocks of flats to be built for the Walsall Corporation has recently been completed by Wates, Ltd. The flats are wired for an electric cooker and power points are provided in each room. A radio and television point is also installed, fed from a common amplifying and aerial system. The heating of the flats is by electric floor warming units embedded in the floors of the hall, kitchen and living room.

Trade Announcements

Turner Brothers Asbestos Co., Ltd., has introduced a new belting symbol for its range of conveyor and transmission belts. The design is the letter "t," the down stroke of which represents a conveyor belt section and the cross-sectional piece a "V" belt. All the company's belting products will in future be marketed under this brand.

The Public Relations Department of **Austin Crompton Parkinson Electric Vehicles, Ltd.,** is now at Water Road, Abbey Estate, North Circular Road, Wembley, Middx. (telephone: Alperton 1641).

Process Control Gear, Ltd., has appointed the Uday Electrical Equipment Co., New Delhi, as its sole agents in India, and the Everglo Electric Co., Bulawayo, as its sole agents for the Central African Federation.

Dexion, Ltd., makers of slotted angle and accessories, have entered the field of industrial partitioning. The materials used in the construction of the partitions are Dexion slotted angle, shelving and glazing strip, the actual partitioning being of hardboard.

Calendars and Diaries

Bakewell Bridge makes an attractive picture for the calendar of the D.P. Battery Co., Ltd.

Each of the large monthly sheets of the calendar of the Fischer Bearing Co., Ltd., has a picture, in colour, of castles in various parts of the country.

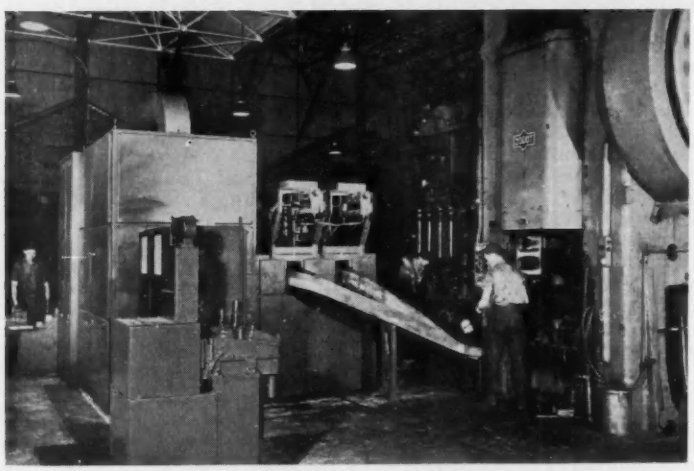
The neat pocket diary received from Tube Investments, Ltd., is bound in navy-blue soft leather.

The London Electricity Board has sent us a pocket diary in maroon leather which contains particulars of the Board's organisation, with the names of the principal executive officers at headquarters and in the various Districts.

A picture of Brixham Harbour, Devon, has been chosen by the London Electric Wire Co. & Smiths, Ltd., for its calendar which has monthly slips.

The pocket diary received from Riley & Neate, Ltd., has over 150 pages of technical data. It is bound in blue leatherette.

A colourful picture of wild duck in flight surmounts the calendar received from Brook Motors, Ltd.



Delivery end of Birlec 400 kW dual-frequency billet heating unit at Forgings & Presswork, Ltd.

STATUS OF ELECTRICAL TECHNICIANS

QUESTIONS ON SELECTION AND TRAINING

As we mentioned in our last issue the Association of Supervising Electrical Engineers held a meeting in London on 1st December at which the education, training and status of electrical technicians was discussed. The proceedings were led by a distinguished panel comprising Professor M. W. Humphrey Davies (Queen Mary College, and representing the City and Guilds of London Institute), Mr. J. O. Knowles (chairman, B.E.A.M.A. Council and Education Committee), Mr. B. L. Metcalf (National Coal Board, and I.E.E. representative on the A.S.E.E. Education and Training Committee), Mr. W. F. Parker (chairman, A.S.E.E. Education and Training Committee) and Dr. J. S. Tait (principal, Northampton College of Advanced Technology, and chief examiner, A.S.E.E. Diploma Scheme). The chair was taken by Sir Josiah Eccles, the Association's president.

"Technician" Defined

The chairman defined a technician as a person who practised an art or a skilful execution of work. He said it was not enough for a technician just to have an *ad hoc* "hunch" that something would work and then, by good fortune, to prove that it would; a good deal more than that was involved.

The first question put to the panel asked whether the present educational system could not be "violently debunked" to everyone's advantage.

Professor Humphrey Davies expressed the view that if someone examined the syllabuses of the City and Guilds he would find that an attempt had been made to avoid the inclusion of difficult material which, though it might help one in the study of other subjects later on, was not absolutely essential for the stage the students reached in taking the course. While it must not be overlooked that the purpose of a course was to raise the student's capacity to above that which it would have been had he not bothered to take the course, they must not aim too high.

Dr. Tait felt that in the selection of technicians there had been a danger of too high an academic standard being required. However, one of the problems of the age was to ensure that a man who specialised had some insight into general matters, and he did not wish to see every technician in blinkers. Mr. Knowles said that at the earlier stage of education the acquisition of some knowledge and discipline in mathematics and Euclid and Latin was a good basis for a technical education.

The question was then raised as to whether sufficient was being done to help men who, perhaps for a reason they could not control, had not done as much as they might in the educational field in their earlier years and wanted to put that right. It was suggested that too little was being done in this connection and the task might not be one that could be undertaken by the local colleges, because very often there would not be a sufficient number of people concerned for appropriate classes to be organised.

The next question considered was whether, so far as electrical technicians' courses were concerned, the time had not come for evening classes to be regarded as an out-of-date educational method. Mr. Parker felt that this question lined up with the times; students were getting lazier and therefore, he supposed, they should be allowed time off from business during the day to attend classes rather than be expected to attend evening classes. But evening classes should not be dispensed with completely. There were late developers to be considered, and those, already mentioned, who had not studied enough in their earlier days. There should be opportunities for such people to undergo technical education at evening classes.

Mr. Metcalf believed that evening classes should be retained for optional subjects and for those who wished to carry their education further. The practice of the N.C.B. was to depend on day release for the training of apprentices.

Dr. Tait, who wished to see evening classes retained for those who had to work during the day, considered that the point of the question might be that courses did not entail enough incentive for a young man attending them to become a technician, when his neighbour was earning just as much money as he in what might be, though not apparently so, a dead-end job. Two or three years previously he had made an analysis concerning attendances at day and at evening classes, and ascertained that the better performance came from those who attended classes in the evening.

The chairman referred to expensive technical colleges and very expensive equipment which were used for only about six hours a day. He wondered whether there was not an economic argument for there to be "shifts" at technical colleges so that their equipment might be used more effectively in this modern age when capital costs were so high.

Apprentices' Studies

The next point raised was whether better results were obtained by apprentices on courses studying for one day a week or for longer periods at intervals—say, for three weeks every three months. Professor Humphrey Davies said he believed it to be more satisfactory for studies to be pursued on one day each week, and this view was generally endorsed. Dr. Tait felt that the one-day-a-week system had worked well, as had the system of apprentices spending six months in college and six months in industry. In his experience, however, a sandwich course involving three weeks in college and six weeks in industry did not work at all well.

It was pointed out that one practical consideration which prevented many employers from being willing to release electrical technicians for day-time study was that of whether the staff so released would remain with the firm at the end of their training. The chairman said he did not consider that any embargo should be put upon a person's right to change his job. There had to be dependence upon people's loyalty influencing them to give back something in return for what they had been given.

The panel was then asked what means existed to examine the practical ability of potential electrical technicians. It was agreed that no generally recognised test existed and that much depended upon the reports of supervisors. In summing up the replies on this point, the chairman said he believed that even for craft apprentices there was no general practical test to be passed. The trade unions might have something to say if a practical test were applied to craftsmen who had completed a five-year apprenticeship.

Interconnection of Power Systems

POWER/FREQUENCY CHARACTERISTICS AND CONTROL TECHNIQUES

Authors' summary of two papers entitled "Power/Frequency Characteristics of the British Grid System" by M. Davies, M.Sc., Ph.D., F. Moran, M.Sc., A.Inst.P., and J. I. Bird, A.M.I.E.E., and "Power System Automatic Frequency Control Techniques" by F. Moran read before the Measurement and Supply Sections of the I.E.E. on 2nd December

THE proposed interconnection of the British and French power systems, which involves the crossing of the Channel, presented many new and interesting problems. Not least of these was the operational problem arising from the proposed use of an alternating current link having a nominal capacity of 200 MVA to connect two large power systems. The capacity of the British system in 1961, when it was estimated that the cable would be commissioned, will be of the order of 30,000 MW and the capacity of the interconnected Western European system over twice this amount.

Although it is now proposed that the interconnection of the two systems should be by a d.c. link, investigations into problems associated with a.c. interconnection are being pursued, particularly as automatic control of the British grid system may be required in the future. The first paper deals with the measurement of the power/frequency characteristics of the British grid system and the second paper describes some of the power/frequency control techniques which may be required.

In any power system the impracticability of making the generation follow exactly the fluctuations in demand results in small alterations in the system frequency. When two systems are interconnected by an a.c. link, a change in the load on one system results in a variation in the common frequency which the turbine governors in both systems tend to correct according to their respective regulation characteristics. This results in power fluctuations on the interconnector which correspond to the permanent equalisation of the two system frequencies.

The transfer capacity of an underground or submarine cable is limited solely by heating and the effect of such power fluctuations is, therefore, much more acute on a cable than on an overhead line. The power fluctuations would be superimposed on the transfer programme and although they would have zero mean value they would cause additional heating and so limit the permissible programmed transfer on a given size of cable.

Power Fluctuations

If the fluctuations of power are rapid compared with the thermal time-constant of the cable, which is of the order of one hour, and if their amplitude is small compared with its rating, the temperature of the core is not materially affected by the fluctuations. If, however, the fluctuations are of comparatively long duration and of appreciable amplitude compared with its rating, the temperature of the cable will rise, with a certain delay.

The rapid fluctuations, having a period of less than one minute, are the power exchanges necessary to maintain the two systems in synchronism. They result from the variations of load and generation on the system, moderated by the spontaneous intervention of the turbine speed regulators which they occasion. These fluctuations are too rapid to seriously influence the secondary regulation whether this is carried out manually or automatically.

The slower fluctuations correspond to the exchanges of power necessary for the permanent equalisation of the mean value of frequency of the two systems. They reflect the nature of the load curves of the two systems and the changes of load by the stations in maintaining or modifying their programmed output to the instructions of Grid Control. Secondary regulation, controlling the power exchange manually or automatically, can either reduce or increase the amplitude and duration of these slower fluctuations according to how effectively control is exercised; they may have a duration of several minutes if insufficient action is taken by the secondary regulators.

Determination of the Fluctuations

To determine the economic worth of a projected cable of given rating, it is necessary to find the probable amplitude and duration of these fluctuations and to predetermine their heating effect so that the maximum permissible power transfer can be estimated. Extensive tests were carried out jointly by Electricité de France and the Central Electricity Authority to determine this information for cables having a nominal capacity of 100 MVA and 200 MVA respectively connecting the two systems.

Theory

When two systems, A and B, are interconnected a power disturbance in either system results in a small variation in the common frequency which the turbine governors tend to correct according to their respective regulation characteristics. This results in power fluctuations in the interconnector which correspond to the permanent equalisation of the two system frequencies. A simple relation connects the change ΔP_I in the power transfer in the interconnector and the change in the difference Δf_{A-B} between the frequencies of the two systems if the same disturbance is applied with the systems disconnected, viz.:—

$$\frac{\Delta P_I}{\Delta f_{A-B}} = \frac{K_A K_B}{K_A + K_B} = \gamma, \text{ say,}$$

where K_A, K_B are the power/frequency characteristics of the two systems.

Tests were carried out to determine for the French and British systems the value of their power/frequency characteristics K and also to verify if the above relationship would hold under actual operating conditions.

The obvious way to determine the power/frequency

characteristic of the system was to produce a known power disturbance sufficiently large for the corresponding change in frequency to be measurable. It was estimated that a disturbance of about 150 MW would be required, and a number of tests were carried out by line-tripping. The north and south of the country were interconnected by a single line in the Midlands and a transfer of 100-170 MW was established, when the line was tripped. The resulting changes in the frequency of the two systems were recorded and the power/frequency characteristic of each system calculated, the power/frequency characteristic of the whole system being given by adding the two values together. The value of K for the British system varied between 2,000 MW/c/s and 5,500 MW/c/s according to plant and load conditions. This means that a 0·1 c/s change in system frequency would result from a disturbance of between 200 and 550 MW.

Operating Conditions

It was only possible to check the relationship between frequency difference and power transfer on an interconnector under actual operating conditions on a statistical basis because of the impossibility of operating two systems interconnected and independently at the same instant. With the same system arrangement as for the tripping tests the two sections of the country were operated interconnected for about fifteen minutes, each section trying to maintain the frequency at exactly 50 c/s with a nominal zero transfer programmed on the interconnector. The interconnector was then opened and each of the two sections again tried to maintain the frequency at 50 c/s. The power transfer on the interconnector was recorded during the first period of the test and the difference between the frequencies of the two sections during the second period. The ratio γ_S of the standard deviations of the two quantities should theoretically be equal to γ_E, the ratio of power transfer to frequency difference in the tripping tests. Comparison of the results of the two kinds of tests verified, within the limits of experiment, that this was so for short periods of time. On the other hand, over long periods of time γ_E and γ_S were not equal because of the effects of manual control.

Having determined the values of the power/frequency characteristics of both the French and British systems the next part of the project was to record the frequency difference between the French and British systems in normal day-to-day operation.

For this purpose a private telephone line was hired between Paris and London and used to telemeter to each country the other's frequency. Each system endeavoured to regulate its frequency to 50 c/s. In France regulation was automatic. In Great Britain regulation was manual in the first part of the test as in normal day-to-day operation and in the second part of the test automatic control was simulated.

By applying the appropriate value of γ to the recordings of frequency difference, the power fluctuations which would have occurred on an interconnector joining France and Britain were estimated. The recordings of power flow derived from these tests were used to estimate the temperature rise which would have occurred in a cable connecting the two countries during the period of the tests. The heating tests were carried out in France using thermal images of 132 kV cables of 100 and 200 MVA capacity.

It was concluded that a programmed transfer of 150 MW on a cable of 200 MVA capacity would be feasible provided that a standard of frequency control at least as good as that realised during the tests was maintained. For this purpose automatic regulation would have to be installed in Britain.

Control Techniques

In the second paper, it is shown that the developments that have occurred in the past two or three decades in applying automatic control techniques to power systems have resulted from definite needs and the progress made in each system in the adoption of automatic control has been largely dependent on the difficulties encountered in operating without it. Whilst some systems have developed in such a way that manual control has been satisfactory up to the present, others developing on different lines have been obliged to use automatic control for many years. However, the recent trend to the international interconnection of large systems, particularly in Europe, has obliged many systems to adopt automatic control where otherwise it would have been unnecessary.

In general, it may be concluded that if the interconnection between two or more systems is effected by relatively weak ties and if there is no single authority responsible for control over the whole interconnection, automatic control will be required. The major interconnections in the U.S.A., where most of the early work in this field was carried out, are formed from the voluntary association of many areas, each with its own control room. The areas are connected by relatively weak ties and there is no overall control authority. Each participant in the interconnection must meet its own load requirements and fulfil its contracts as to power interchanges with its neighbours. Any failure to do this will result in unscheduled power flows across its boundaries and throughout the interconnection. Each area is also required to contribute to the control of the frequency of the interconnection as a whole through the operation of its speed-sensitive governors. These requirements can be met by the use of frequency-bias tie-line control which requires that the loading of the sets in each area shall be adjusted so as to preserve the net transfer at a value differing from the programme by an amount proportional to the instantaneous frequency error.

To carry out the continuous adjustment of generation necessary to meet this requirement, automatic control has been found essential. The first element of a typical control scheme is a master controller which determines the regulation required from the frequency and net transfer. It initiates "raise" or "lower" impulses when control action is needed which are routed to the plant selected to carry out the regulation. The selection of plant may be carried out manually or automatically but the trend is towards the latter. By such techniques the area generation can be made to follow the demand over the whole daily load-cycle. At some times of the day, regulation may have to be spread over several sets simultaneously so as to achieve the required rate of response but all such special requirements can be readily accommodated.

Method of Regulation

In Europe, interest in automatic control was stimulated by the trend towards international interconnected operation. Thus it has proved essential where large systems are connected by lines capable of carrying only a small fraction of the powers of the systems. The tendency, particularly where regulation has to be largely carried out by thermal plant, is to adopt schemes where the regulation is shared between many sets, so that each contributes a specified fraction of the total required at any time. A single master controller may be used, as previously described, but instead of control pulses being

sent to a selected station, a signal, termed the "level," is transmitted to all the regulating sets. The "level" is a measure of the regulation required and each regulating set is fitted with special equipment which balances its output against the level. Any change in the latter is accompanied by a corresponding change in the outputs of all the regulating sets. Any type of control action (e.g. integral control) can be achieved by suitable design of the master controller.

Electrical Governors

In the cases so far discussed the automatic control has been supplementary to the normal action of the speed-sensitive governors of the sets and hence can be regarded as "secondary regulation," the governors providing the "primary regulation." Load changes are first met by the action of the primary regulation, the resultant speed and transfer errors being corrected by the secondary control. This brief account would be incomplete, however, without reference to the adoption in Sweden of electrical governors. The situation arose in Sweden some years ago where the speed control achieved by mechanical governors was unsatisfactory. The system consists mainly of hydro plant and all regulation is carried out on this. As frequency control was the primary requirement a solution was adopted in which the mechanical governors were replaced by a type in which electrical circuits were used to measure the frequency error, and initiate the control action required. The design was such that the response time and sensitivity could be adjusted at will, and this led to an operating technique in which a master station was selected and its regulator adjusted to give practically pure integral control whilst the remaining stations had a proportional action. By this means the master station fulfilled the role of secondary regulation and the remaining stations that of primary regulation. This operating technique has been modified to reduce the demands on a single station acting as master, but the flexibility and performance of the electrical governors have proved them to be a highly successful development.

DISCUSSION

The discussion on the two papers was opened by Mr. P. W. Cash (Central Electricity Generating Board), who suggested that the present standard was quite satisfactory for large commercial supply. Automatic control would cost about £400,000 to install, and it was not yet clear whether it would produce economy of operation. It might even do the reverse. Mr. Cash was confident, however, that it would come as part of a general process of automation. The automatic control of power stations was something for the future. Automatic load dispatching was bound to come, and automatic frequency control would be needed to match in with those other automatic features. Therefore, it would be of advantage to carry on with the development work and to go in for a larger pilot scheme of automatic control so that it could be installed when necessary.

Mr. H. F. R. Taylor (C.E.G.B.) agreed that automatic frequency control could not be justified as an operational necessity or as an economic factor at the present stage. It must be remembered that the Central Electricity Generating Board was not an island electricity undertaking. There was interconnection with two other authorities—one very small but the other by no means small on the standards adopted abroad. The total load of the Scottish network was about 2,000 MW, and that network could speak in its own right as regards the standard of frequency which should be maintained.

We were, therefore, not entirely our own masters in this matter of frequency control. For that reason we ought to pioneer our efforts to perfect our frequency control. More automation should be introduced in the system. Whatever form that automation eventually took, the pioneering work in connection with auto-frequency control would form a good basis for further development.

One of the many factors on the system which helped to maintain frequency was the thermal inertia of the boiler plant. It was necessary to be on guard, however, because modern trends in boiler design suggested that the thermal inertia of boilers would become less until the stage of super-critical plant was reached when there was no thermal inertia whatever.

Monsieur Favez (Electricité de France) recalled that the "power-phase-energy" control system was first installed in France in 1953, and the whole of the French network had been operated by that method since 1955. Mr. Moran described that regulating process which allowed for the participation of a great number of machines in the regulation, thus reducing the work of each of them. The present peak power of the French network was 11,000 MW, and the total nominal power of the machines able to participate in the regulation was nearly 3,500 MW, including half hydraulic plants and half steam plants. The total regulating band or the sum of the highest power variations of the regulating groups reached 1,200 MW. The control gave full satisfaction, and had permitted the interconnection of the German 18,000 MW and the French 11,000 MW networks by a single 225 kV line without power fluctuations on each network entailing interruptions of the interconnecting link.

Mr. E. B. Powell (C.E.G.B.) said it was difficult to see why, in modern systems, the centrifugal governor was wanted at all. Automatic control work on the speeds of governors would, he felt sure, be perfectly satisfactory, and it was to be hoped that it would one day be seen.

Mr. P. D. Aylett (Brunel College of Technology) said that on going round power stations he gained the impression that the control of power systems was something to which not a great deal of thought had been given. It appeared that operators spent all their time trying to frustrate the efforts of automatic control equipment. The introduction of a new form of governor was long overdue. The present governors were a monument to Watt, but represented an expensive way of remembering that great man!

Mr. P. F. Gunning (C.E.G.B.) said that the answer to many of the problems was of course to use d.c. interconnection, but as that could be afforded only on an international scale, it would seem that automatic frequency control was the answer. It would be interesting to see a second attempt made to try out automatic frequency control on the British grid.

Electronic Jet-Engine Control

IN a paper presented on 9th December before the London Graduate and Student Section of the Institution of Electrical Engineers, Mr. H. E. Coles dealt with the evolution of automatic control of jet-engined aircraft at supersonic speeds and high altitudes with the aid of electronics.

Changes in altitude and forward speed necessitated, he said, compensation of fuel flow for variations in ram intake pressure and temperature. Rise in turbine temperature above a safe value could be prevented by an electrically compensated feedback at any selected speed. At the top of the power range thrust could be regulated by a variable final nozzle mechanism integrated with the pilot's lever. Signals by electric sensors were fed to an electronic amplifier operating a servo valve controlling the flow of oil by hydraulically operated nozzle actuators. Such controls, however, were merely trims. A fully integrated system with a variable geometry engine could feed all engine and aerodynamic conditions to a central computing unit monitoring the controls.

When running at full capacity and for any mach number and altitude a variable air intake would be required to alter the cowl shape to give good pressure recovery. This would be done by an electrically actuated closed-loop position control of a movable central body with spiked tip. Many electronic components could not be used without forced cooling at ram-air temperatures over 150 deg C.

Scrap-Metal Contracts

REPORT ON LONDON ELECTRICITY BOARD PROCEDURE

ARISING out of statements made last year by Mr. G. R. Strauss, M.P., regarding the London Electricity Board's methods of disposing of scrap cable, the Board asked the Minister of Power to arrange for an independent inquiry into the matter. Subsequently Lord Mills appointed Mr. H. Benson, C.B.E., a chartered accountant, to conduct an inquiry and Mr. Benson's report was published last week as a White Paper (Cmnd. 605, H.M. Stationery Office, price 2s).

The substance of the allegations made by Mr. Strauss were that the method adopted by the Board for disposing of scrap cable was unsatisfactory and should be replaced by another method; that as a result of the present system the Board was responsible for loss of public money and other serious deficiencies in administration; and that the scrap metal trade had suspicions that a person or persons in the Board had an ulterior or improper motive in retaining the system.

Method of Disposal

Since 1954 the Board has, in February of each year, invited merchants to tender for scrap material arising during the ensuing year, including mixed copper cables, clean copper, tinned copper, scrap lead and other non-ferrous metals; and scrap cookers and other ferrous metal. Mixed copper cables are the predominant item. Mr. Benson gives full details of the method and conditions of tendering and says that adjustments are made weekly in the tender price for scrap cable according to the fluctuations in copper and lead prices. The highest tender is normally accepted but there are certain minor qualifications, which are considered to be justified.

Mr. Benson says that there were complaints by the scrap metal trade as far back as 1954 and there were others, apart from those referred to by Mr. Strauss. Responsible members of the trade gave Mr. Benson their reasons for dissatisfaction but after considering these Mr. Benson thinks that the Board is entitled to continue the present system provided there are reasonable grounds for believing that the net sums realised are as high on average, as sales by any other method. He shows that on several occasions contracts have been given up by merchants because the prices were found to be too high. The Board's receipts compare favourably with those of six other Boards which provided figures of scrap sales. On the other hand a test assay made (admittedly insufficient to justify general conclusions) suggested that it would be prudent to make a periodical independent check of contract prices.

In the light of these investigations Mr. Benson considers that the allegations of loss of substantial sums of public money and other serious deficiencies in administration are not justified.

Mr. Benson found that suspicions existed in the scrap metal trade of ulterior or improper motives on the part of Board employees but, with a single exception, he could obtain no concrete evidence of this. The exception involved the purchase, in 1952, of a car by a member of the Board's staff from a company of scrap metal merchants. The price paid was £200, said to be half of the real value. Mr. Benson found that this car had been bought by the company for £358 for use in its business. At the time of the sale its value had been written down to £113. Advertisements in *The Autocar* showed that at that time this type of car was being offered at between £300 and £475. Later the Board's officer spent over £40 on the car and eventually was allowed £245 in part exchange of another car from a firm of car dealers.

While Mr. Benson thinks that such transactions should not take place, he is satisfied that this transaction did not cause the officer concerned to attempt to influence the Board's decision to institute and retain its tendering system; nor was he in a position to do so.

The report records an instance in which a scrap metal merchant had sent £50 in notes to the same officer who reported the matter to his superior officer who in turn notified the then chairman of the Board. As a result the merchant was asked to attend the Board's offices when his money was returned and he was told that he would be prohibited from tendering for the Board's scrap metal for two years.

Officers of the purchasing department told Mr. Benson that they were accustomed to receiving at Christmas presents of bottles of wine or spirits or occasionally boxes of cigars from successful tenderers for scrap cable. Members of the trade said that gifts to customers were customary and Mr. Benson says he is aware that the practice is not infrequent in other commercial and industrial enterprises. He was told by the present chairman of the Board (Mr. D. B. Irving) that he and his predecessor knew that such gifts were made and the practice was approved provided, as is the case, they were shared among the staff. When gifts were offered to the Board's staff by unsuccessful tenderers they were returned. Mr. Benson considers that as the custom is known to, and approved by, the chairman and deputy chairman of the Board no blame can be attributed to the staff of the purchasing department but the practice is undesirable and should be reconsidered by the Board with a view to ending it.

After taking evidence from scrap metal merchants who had alleged that the Board conducted this business unfairly, Mr. Benson finds that there is no substance in any of the three specific complaints investigated. The system laid down by the Board for controlling scrap cable from the time it arises until it is delivered to the merchant is said to be sound.

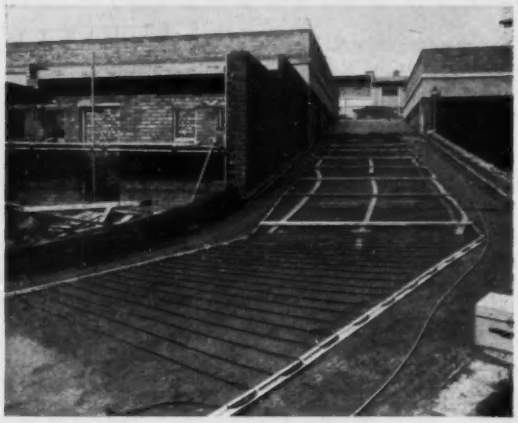
Appendices to the report contain copies of the correspondence between Mr. Strauss, Mr. Irving and Mr. R. Maudling (Paymaster General) and the solicitors to Mr. Strauss and the London Electricity Board; a chart of part of the organisation of the Board; a schedule of tenders for scrap cable; and a table comparing prices received for scrap cable by the London Board and six other Electricity Boards.

Mr. H. J. Randall, former chairman of the London Electricity Board, commented on the report in *The Times* on Tuesday. He said that there was one important omission. One of the reasons for deciding to clear scrap metal as soon as possible, rather than accumulate it as suggested by dealers, was to minimise the risk of pilfering which was prevalent. Mr. Randall also said that the report had removed the stigma under which the Board had lived for many months. He concluded by suggesting that Mr. Strauss ought to write " a dignified withdrawal and a word of regret."

OPEN AREA HEATING

INSTALLATION AND CONTROL

By A. B. Hillier*



Heating cable before screeding

Experiments in the electrical prevention of icing on roads are being conducted by the Road Research Board. This article gives details of a permanent installation, with a special form of control, carried out at Corby New Town

ELECTRIC heating as a means of frost and ice prevention for large open areas, has not been applied to any extent in this country although installations have existed in America and Canada for some considerable time. Interest is now being taken in this aspect of heating, especially in connection with road surfaces, and in this article the writer endeavours to give some idea of the various problems that can be encountered.

An example of this method of heating has recently been completed in Corby New Town, Northamptonshire. The car park for the shopping centre has been built over single-storey shops and the entrance and exit are served by fairly steep ramps, each about 13ft wide by 120ft long with gradients of about 1 in 12.

As these ramps, for architectural reasons, are not covered or sheltered from the weather, it was necessary to ensure complete safety by preventing ice formation on their surfaces and the Corby Development Corporation decided to make use of electric heating for this purpose.

It was essential that the installation should operate automatically and without trouble at all times; that the primary cost should not be excessive; and that the running costs should be reasonable. Both low- and medium-voltage systems were considered, but it was found that the cost of the l.v. equipment would make the installation uneconomical whereas a medium-voltage installation presented no real difficulty.

As the road surfaces were to be subject to a considerable amount of traffic, the installation required a heating cable that could not only withstand the stresses and vibration set up, but would give permanent service. A very thorough examination of possible causes of cable failure was therefore called for before specifying the cable to be used. Probable causes of failure were as follows:—

(a) Oxidisation and/or deterioration of the core due to air, moisture and acid or alkaline reaction.

(b) Chemical or electrolytic action between the core and the surrounding sheath.

(c) Decentralisation of the heated core in the sheath.

(d) Core rupture due to road movement, cracking, subsidence or expansion of the material surrounding the cable.

(e) Breakdown of the surrounding insulants and/or sheaths from any of the above causes.

(f) Ageing and general deterioration of the insulation and sheaths.

(g) Damage to the cable during installation.

(h) Damage caused by the penetration or abrasion of foreign bodies working through the surface material.

At first glance one may feel that no heater cable could be economically manufactured that would satisfy these requirements. The writer has, however, been actively concerned in electric floor and ceiling heating design and installation for the past 24 years, and during this period has had ample opportunity to make a close study of the cause of failure of heater cables. With the co-operation of the manufacturers, Aerialite, Ltd., such a cable (" Ashatherm ") was designed some years ago and since it was marketed has proved very successful.

The cable is constructed with three separate insulation layers and protective coverings, the core being of a copper or copper alloy base. The primary insulation of the core consists of a tough, flexible and stable high-temperature resistant enamel conforming to B.S. 1844:1952—a material well proved by the electrical industry over the last 40 years. The enamel is a perfect insurance against oxidisation and moisture penetration and, being chemically inert, does not cause any interaction between the core or the surrounding insulant or sheath. It has a high electrical resistance.

In view of the fairly recent developments in synthetics such as nylon, silicones, etc., the use of enamel may be regarded by some as a retrograde step. But the relatively short period in which these materials have been in use has not been sufficient to prove their endurance, particularly when considering a life period of 50 years or more. Laboratory ageing tests may give a reasonable indication but cannot be regarded as wholly certain. The life period of enamel insulants has, however, been established beyond doubt.

To prevent decentralisation of the heated wire through the surrounding sheath, a non-thermoplastic non-ageing

* Sales Manager, Electra (Birmingham 1935), Ltd.

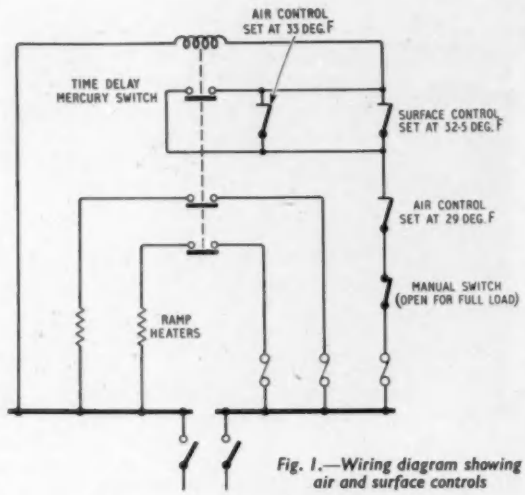


Fig. 1.—Wiring diagram showing air and surface controls

resilient elastomer of a radial thickness of 35 mils covers the core. It is important to consider the action of the heated core on the sheath when dealing with heating cables. If the core is in direct contact with a sheath of thermoplastic material, the heat and weight of the core and also its vibration caused by traffic or other movement will, in the writer's opinion, cause the core to gradually move through the sheath, until it finally becomes exposed. This may take a number of years, but the result could be a relatively short-lived heating installation. It is essential, therefore, to ensure that the material surrounding the core is of a non-thermoplastic nature and of sufficient radial thickness to prevent this possibility. The particular material used in this cable also acts as a further insulant.

The final sheath consists of a high-grade high-temperature-resistant p.v.c. conforming to B.S. 2746:1956. Apart from acting as a further insulant, the covering, which is impervious to the majority of chemicals, toughens the construction and increases the resilience of the cable. Normally this outer sheath has a radial thickness of 35 mils but, anticipating very rough treatment during the construction of the ramp, it was decided to increase this to 110 mils, the final diameter of the cable being approximately $\frac{7}{16}$in.

The extra heavy sheath also minimises the possibility of core rupture. Should any transverse cracks occur in the structure of the ramps, the core elongation will not be localised around the cracks, and any stretching of the core will take place over the whole lenght of the lateral runs.

Loadings

The most efficient loadings for any type of heating cannot be calculated satisfactorily until the basic design temperature has been established. It is also necessary to give due consideration to the most efficient system of control and the tariffs available. To ensure full efficiency, the B.Th.U. output was calculated on the lowest likely temperature to be reached in this area, and from records this was established at 20 deg F, excluding odd days. Wind velocities also played an important part in the calculations; as the ramps could produce a "funnel" effect it was decided to allow a slightly higher than normal factor. The "restricted period" or "off-peak" tariff was considered, but finally discarded for reasons given later, and the final loadings of 8·2 kW and 7·4 kW were based on the use of electricity at any time.

Although primarily the system was designed for ice prevention, there is a strong possibility that the installation will deal adequately with snow clearance, apart from drifts or very heavy falls.

Controls

Records of temperatures during the last 25 years in the Midlands area during the heating seasons, show that the periods when the temperatures were between 32 and 29 deg F against the periods when the temperatures were below 29 deg are in the ratio of about 4:1. A considerable saving per season could therefore be achieved if the loadings could be adjusted to serve both groups of temperatures without undue waste. A step system utilising voltage variation or a series of circuits represented a fairly high capital cost, whereas the final control system evolved to give the variation in B.Th.U. output required is probably simpler and considerably less expensive.

The object is to maintain the temperature of the surface of the ramps above freezing point and therefore for the main control a device operated by the surface temperatures was used (see Fig. 1). Only one was required and the position chosen on the "down" ramp excluded the possibility of any effect from direct sun rays. It was apparent that if this device was fitted directly to the surface, either the heating would come into operation when the surface temperature dropped to 32 deg F and, because of the relatively slow movement of heat from the cables to the surface, would allow icing to commence, or, alternatively, if the thermostat was set at a sufficient number of degrees above freezing point to prevent this, the ramp heating would operate when air temperatures were above freezing, thus increasing running costs.

To accelerate the "switch on" stage when air temperatures were approaching 32 deg F, the control was mounted on the underside of a 6in phosphor-bronze plate which formed the lid of a box of the same material terminating flush with the ramp surface. A special cork seal between the lid and the box, acted to a certain extent as thermal insulation (Fig. 2). As the metal plate is mounted on a vertical air space, the heat extraction rate from the plate will be considerably greater than that from the surrounding ramp material, and therefore the control will operate at a sufficient period before the ramp surface reaches 32 deg F, thus compensating for the relatively slow movement of the heat from the cables to the surface.

The surface area and metal content of the plate, the rate of transmission of heat from the ramp to the plate, and the rate of heat movement from the cables, were carefully calculated before deciding on the setting of the control which was finally put at 32·5 deg F.

Although the writer refers to thermostats, the use of these, thermocouples and other similar equipment, was discarded in favour of the more simple, robust and constantly accurate contact thermometer which can operate to an accuracy of ±0·25 deg F. After consultation with the manufacturers (Engel & Gibbs, Ltd.), a

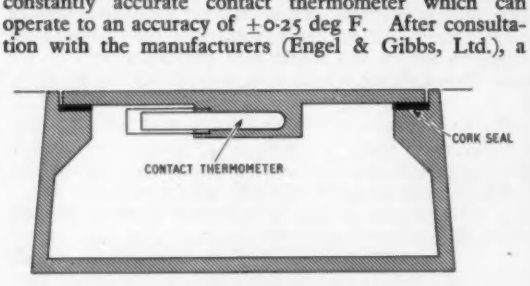


Fig. 2.—Surface plate control

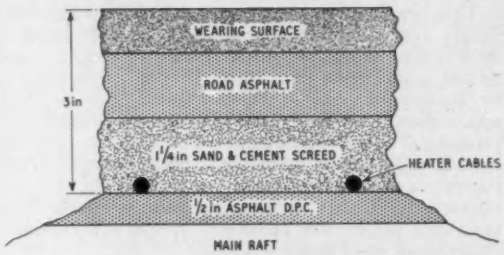


Fig. 3.—Cross-section of ramp construction

contact thermometer operating in a horizontal position with sufficient overshoot to overcome the highest sun ray temperature, was fitted into the small boss in the centre of the control plate (Fig. 2).

Having therefore accelerated the " switch on " operation, it was necessary, for the sake of economy in running costs, to ensure that the heating switched off immediately the air temperature rose above freezing point. A further contact thermometer set at 33 deg F was introduced into the control circuit. As this operated on air temperature only, it was fitted to the wall of an adjacent building.

Pulse Control

It was calculated that to successfully prevent ice formation between 32 and 29 deg F, half the actual installed loading would be more than sufficient. For the sake of economy, only one circuit was fitted to each ramp and therefore the B.Th.U. output could only be varied by means of a pulse injection system if primary costs were to be kept within reason.

The system of pulse injection to vary heat output is not new—the " Simmerstat " represents one of the most popular forms. The one evolved employs a longer time cycle and is operated by a simple device. The basic principle is as follows:—

A flow of current is allowed in the circuit for a short period, the current is arrested for a further period and the cycle repeated continually. The variation of the B.Th.U. output depends on the ratio between the two periods. The efficiency is slightly less than with continuous operating current, but this is more than compensated by the total saving.

It must be understood that the circuit for a contact thermometer is of the closed type, breaking on fall and making on rise. A reverse acting relay is used to operate the main load contacts which in this case are special mercury switches. In other words, the coil of the relay is energised when the contact thermometer closes (above design temperature), thus holding the load contacts in an open position.

To operate the pulse system, a special mercury switch was mounted on the main relay spindle actuated by the relay coil. This switch has a restricted throat through which the mercury flows to make contact. Immediately the switch assumes a closed position, this throat retards the time of contact. The flow of mercury is again retarded when the switch assumes an open position, thus creating a time delay on every opening and closing operation. The two contact thermometers and the delay switch are connected in parallel and are in series with the relay coil. A further contact thermometer set at 29 deg F is connected in series with the control circuit, and the controls operate as follows:—

As soon as the falling air temperature reaches 33 deg F the wall thermometer opens, but no current can flow until the plate temperature drops to 32·5 deg F. The pulse switch, of course, is in an open position when the coil is energised. Immediately the plate temperature reaches 32·5 deg F the control circuit is opened and the main contacts are closed. At the same time the pulse switch assumes the closed position and after a period contact is made. This immediately opens the main contacts and after a pause the pulse switch opens the control circuit, thus repeating the cycle whilst the two contact thermometers remain in an open position. A rise in air temperature to 33 deg F closes the control circuit and opens the main contacts. If, however, the air temperature drops below 29 deg F, the control circuit is opened by the final contact thermometer and remains open until the temperature rises and the pulse system starts once more.

A moderate fall of snow will require almost full load and when it occurs a manual switch on the panel can open the control circuit to operate on full load. To ensure that the system is operating correctly, a series of pilot lights, giving fuse failure warning and operation warning, are mounted in a small panel fitted in a conspicuous position in the main public entrance hall of the adjoining building. The main control panel incorporates radio and television suppressors and the coil of the relay is fitted with a " Metrosil " surge divertor.

Running Costs

It has been calculated that the average consumption per season will be approximately 9,200 kWh. A system without pulse control would consume approximately 13,000 kWh. On the tariff offered, the annual running cost is approximately £38 against £54, a saving of £16 per annum.

It has probably occurred to some readers that it might be more economical to utilise the night storage system at off-peak rates. However, as the installation is primarily designed to ensure complete freedom from icing both by day and night, the writer considered that restricted hours of heating would not be sufficient to ensure continuous defrosting. When calculating loadings for schemes of this nature, it is essential to consider wind velocities and heat losses due to evaporation on the surfaces. Although the temperature differentials are small, the heat loss rate can be considerably higher than in normal buildings with some thermal insulation. Obviously, the ramps possess a degree of thermal storage, but when one considers the additional loading required to ensure at least ten hours of frost-free conditions when no heat is being generated, one soon comes to the conclusion that the night storage system (even including a boost period during the day) is not only costly but also not entirely satisfactory. Conditions could arise where extensive sleet would rapidly exhaust the residual heat and without a quick replenishment of the heat the surfaces would not remain ice-free.

At the same time consideration must be given to light frosts that can be experienced during the spring and autumn. Very often no ice conditions result from these frosts and therefore there would be considerable waste with off-peak heating. Safety has taken precedence over economics and no comparison should be made between the running costs quoted and the cost of salting the ramps, although taking into account labour, transport, material and storage the difference is surprisingly small.

Construction and Installation

Generally, road surfaces are finished with normal road asphalt applied directly on the concrete structure with a final wearing surface rolled in. From time to time, the asphalt will require renewing as the surface deteriorates over the years, and it was therefore essential that pro-

vision should be made to prevent disturbance of the cables when a new surface was required. A cement screed about 1¼in thick laid over the heater cables served the double purpose of ensuring against the above possibilities and preventing damage by foreign bodies working through from the surface (see Fig. 3).

The laying of the heater cables presented no real difficulty and the operation, including the screeding, was completed in a very short time, the cables being monitored continually with a special instrument during the process.

Both heater banks terminated in watertight boxes fitted in the pavement of the ramps and were connected to the main feeder cables through a special connector block, each box being filled with waterproof compound after connection. False covers and registers were fitted flush with the pavement above the boxes to give access.

This system of control has many applications, but to ensure reasonable running costs for larger areas the system of pulse control can be elaborated to give a three- or four-stage operation. Road heating or de-icing will be confined mainly to danger spots, such as bridge approaches, roundabouts, sharp bends, steep inclines and probably "zebra" crossings. The call for open area heating will be more extensive—sports fields, aerodrome runways and step heating are only a few of the possibilities. As electric power becomes relatively cheap, open area heating will become more appreciated and the applications more varied.

The writer wishes to stress that the successful completion of the installation described, was due to the close co-operation of all firms concerned under the management of the Corby Development Corporation.

NEW HEAVY DUTY POWER CABLE

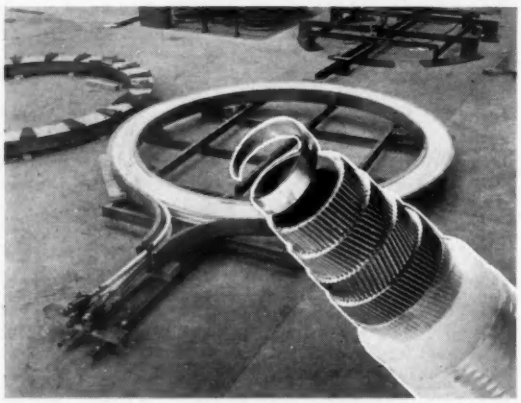
AN internally water-cooled power cable, believed to be the first of this type in the world, has recently been supplied by Siemens Edison Swan, Ltd., for installation in the 450 MeV synchrotron at Glasgow University. Capable of carrying a current approximately double that for which a comparable size conventional cable is rated, the water-cooled cable has been designed and developed by the company for use in situations where restricted space renders heat dissipation difficult.

The overall cable diameter is 1·7in, and, with a conductor cross-sectional area of ½ sq in, it is rated for 850 A a.c. continuously, without cooling water flowing. In the synchrotron soft water from the supply main is used and the cable is operated at a potential of 8·10 kV to earth, carrying 3,000 A d.c. continuously plus 1,600 A pulses of a few milliseconds duration each half-second. Some typical cooling figures given for a 100 yd length of the cable, carrying 1,150 A, include a water temperature rise of 25 deg C with a coolant flow of 1½ g.p.m. Constructed of four concentric layers of copper conductors surrounding a copper spiral cooling duct, with polythene insulation and terylene braiding, the cable is tested to withstand 200 p.s.i. internal pressure.

In addition to the improved cooling the use of water assists in preventing air spaces forming against the polythene, an important point with synthetic materials. Cables rated for operating voltages up to 132 kV to earth are envisaged for use in general distribution systems and such situations as the interconnecting link between a water-cooled alternator stator and the primary of the generator transformer.

A similar cable has been supplied to A.E.R.E., Harwell, in connection with the ZETA project, and inquiries have been received for this type of cable from both this country and France.

The coil for installation in the Glasgow University synchrotron and (inset) a cut-away section of the cable



I.E.S. Jubilee

ARTIFICIAL lighting is so much a part of modern life that it is taken very much for granted and it would be a salutary experience for most of us if we were compelled to do without it for any length of time. Very few activities would be unaffected such is the diversity of interests with which the lighting engineer is concerned. It is this diversity of interests and applications which brought the Illuminating Engineering Society into being fifty years ago. It was on 9th February, 1909, that an informal meeting was convened in the Criterion Restaurant, London, and it was agreed to form an illuminating engineering society with the famous Professor Silvanus P. Thompson as the first president. By the end of that year the Society had 157 members.

When, on 9th February next year, in the same restaurant, the Society holds its golden jubilee commemoration dinner, those present will represent a society of more than 2,500 members with thirteen provincial centres plus one in South Africa and an overseas membership of more than 300. This function will be but one of many celebrating the jubilee of the Society. There will be a joint meeting with the Electrical Association for Women to provide a forum on home lighting in January. In February there will be lighting displays at the Birmingham Science Museum and the National Museum of Wales, Cardiff. In March there will be a joint meeting with the Institution of Electrical Engineers at which fifty years of lighting development will be discussed and during the same month lighting will be the main theme of the Electrical Engineers' Exhibition.

In the autumn there will be a series of special golden jubilee lectures delivered by such speakers as Sir Lawrence Bragg, Mr. J. L. Davies, Dr. W. H. Glanville and Mr. A. N. Irens.

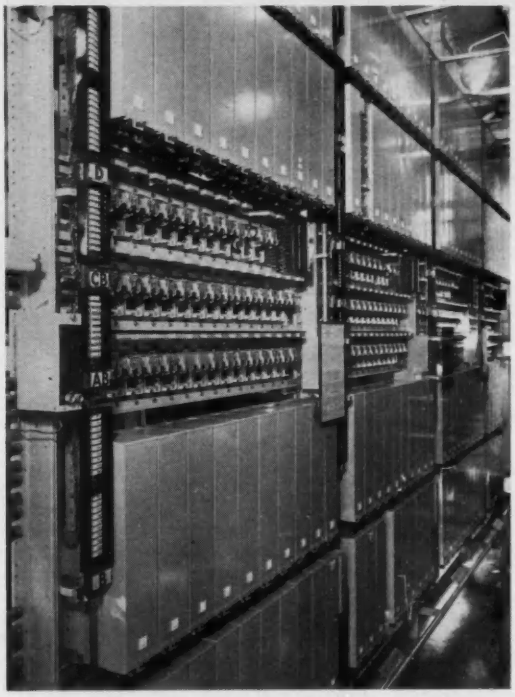
SUBSCRIBER TRUNK DIALLING

The Queen Commissions the First STD Exchange at Bristol

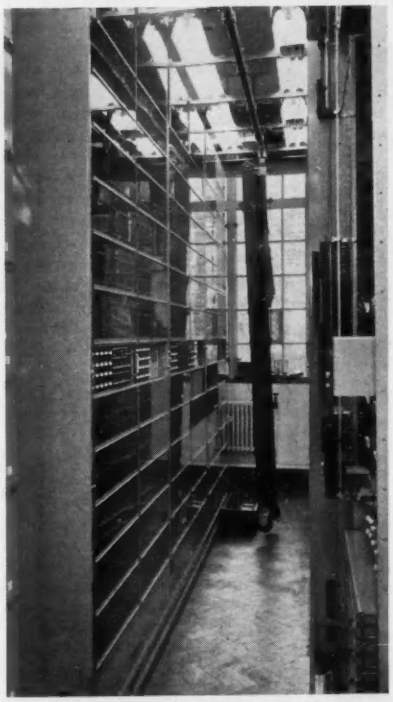
The new system at Bristol is based on electronic equipment which will route and charge long distance calls. The operation of this equipment, which will play an important part in the modernisation of Britain's telephone system, is described

THE first subscriber trunk dialling equipment was put into service by the Queen at Bristol telephone exchange last Friday, when she dialled the first trunk call and spoke to the Lord Provost of Edinburgh at the City Chambers. Proposals for the introduction of STD were outlined in a Government White Paper (Cmnd. 303) which was presented to Parliament last year (see *Electrical Review*, 22nd November, 1957).

Subscriber trunk dialling is the major item in the modernisation of the telephone system in Great Britain. Although the subscribers will keep their present numbers, a system of national telephone numbers will be instituted for calls from distant parts of the country. Extra code numbers must be dialled in front of the existing ones for long-distance calls. These extra numbers will operate an automatic exchange system which will do the work now done by the operator in obtaining the distant exchange. The new system at Bristol is based on electronic equipment which interprets the code numbers dialled and routes the calls to the distant exchange. The equipment also operates the new charging system which is based on time and distance. The full style of this equipment is group routing and charging equipment, "GRACE" for short.



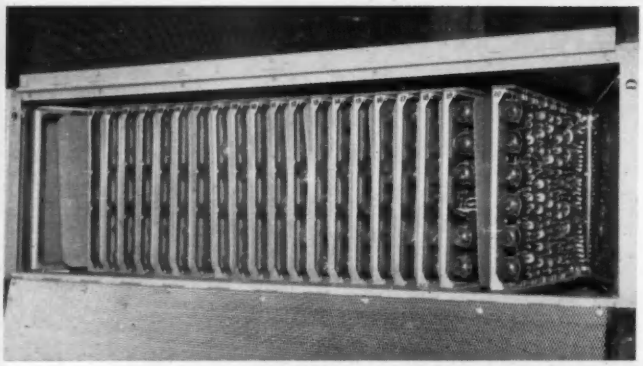
Rack of register access relay sets



Racks containing the electronic registers and translators

At a Press conference, Mr. Ernest Marples, M.P., Postmaster General, briefly reviewed the reasons for the introduction of subscriber trunk dialling. He mentioned that the average cost of installing a telephone for a subscriber was £120. Of this figure £95 was the cost of the wiring to the exchange, £16 for the equipment at the exchange and £9 for the telephone in the subscriber's house. The wiring between the exchange and the subscriber's telephone accounted for a quarter of the total cost of all the Post Office telephone equipment. One way of reducing these costs was to use multi-frequency channels with coaxial cable, but this could only be applied to links between exchanges. The Post Office recently introduced a new system of group charging, which helped to reduce their running costs, and now, with the introduction of STD, the labour costs of exchange operators would be reduced. Long-distance calls would be easier to obtain and cheaper to the subscriber. In this way it was hoped to increase the use of the telephone system.

An exhibition of STD is being held at Bristol so that subscribers in the area affected can see how the apparatus operates. During the Press conference, Mr. Marples



A register showing the cold-cathode tubes and the leaf construction

demonstrated trunk and local calls on private and coin box STD equipment. With this demonstration equipment, the metering system can also be observed and it can be seen that the meter starts operating when the call is answered and stops only when the calling subscriber replaces his instrument. Mr. Marples also demonstrated how it is possible to convey quite a lot of information during a 12 second long-distance call costing 2d. He said that 600 operators at the Bristol Central Exchange were reduced by 120 with the introduction of STD and this number would be reduced still further as the system was extended to other exchanges. Bristol subscribers could still use exchange operators if they preferred, but would then have to pay the normal rates. He said that there were 65,000 telephone kiosks in the country and on each there was a loss of about £40 per annum. One kiosk was recently installed in Aberdeenshire at a capital cost of £1,000 and was taking an average of 2s 6d a week in telephone charges.

All national numbers will start with "0" and dialling "0" connects the call to "GRACE." Initial connection is made to a register access relay set or call charger. The call charger remains associated with the call throughout its duration, its main function being to start charging at the appropriate rate when the call is answered and to continue charging until the calling subscriber hangs up. For setting up the call and selecting the correct charging rate, two further items of equipment, a register and translator, are called into use.

Registers, which are used only during the setting-up of a call, are provided in a common pool which can handle 66 calls simultaneously. A call charger taken into use by a call associates itself immediately with any available free register. The registers at Bristol are of electronic design based on the use of cold-cathode tubes interconnected by miniature selenium rectifier gates. To ensure correct operation of the cold-cathode tubes, they are placed in racks behind red-tinted acrylic plastic and the exchange is equipped with unswitched fluorescent lighting.

The number dialled by the subscriber is received by the register, counted and coded electronically and stored on cold-cathode tubes in "2-out-of-5" code. A total of 45 tubes per register is provided for this purpose giving a capacity for nine digits.

The first one, two or three digits received by the register identify the charging group of the wanted exchange. It is the function of the translator to inspect these digits and deduce from them the route and charge rate for the call. The translator incorporates a permanent memory of the route and charge rate for all calls that can be made by Bristol subscribers. The translator is required since the national telephone numbers are determined by the name of the exchange so that any exchange can be dialled by a distant subscriber in any part of the country by using the same code. However, the actual code transmitted from a particular subscriber's exchange differs from exchange to exchange and therefore a translator is required to transmit the actual code.

The translator is also of electronic design and can deal with a register in a few milliseconds. This high speed of operation permits it to control up to 40 registers, to each of which it is connected sequentially by electronic gates once every two-thirds of a second. Each time it is connected to a register it decides what action, if any, is required and sets the register to perform this action. While the translator is dealing with its other registers, the register carries out this action and when this is completed receives a further instruction on its next connection to the translator. This master control arrangement permits a relatively simple design of register since it is called upon in the main to carry out only similar and simple operations.

The first instruction given to the register is a signal representing the charge rate for the call. This is passed by the register to the call charger, where it sets an electromechanical switch to select the appropriate metering rate ready to start charging when the call is answered. Subsequent instructions cause the register to send suitable signals to the automatic switches in the local and distant exchanges to route the call to the required exchange. These are followed by the digits of the called subscriber's number, which have been stored in the register and select the required line. When the connection is complete, the register is released from the call charger and is free to set up further calls. When the call is

The two pulse metering equipments at the Bristol exchange

answered the call charger operates the calling subscriber's meter once and then periodically throughout the call at intervals of time depending on the distanec.

Metering

The metering equipment at the exchange is automatically set for the correct rate by the register. Immediately the call is answered, a pulse is sent to operate the calling subscriber's meter which, in effect, charges for the first interval of time. The rate of the following pulses has a frequency of six times that of the appropriate metering rate. The calling subscriber's meter is next operated at the seventh pulse and thereafter every six pulses. The subscriber is therefore safeguarded against loss of time which could occur if a single-pulse metering system were used and his call started between two pulses.

The meter on which the call charge is recorded is the one previously used only for recording local call charges. It is an extremely reliable mechanism of the Veeder type and each line in the exchange has its own meter. If, however, a subscriber must know the cost of a dialled call at the time it is made to charge it to the user (e.g. in a hotel), a meter can be rented and installed at his premises to work in step with his meter at the exchange.

By means of a red "fly-back" pointer on the Ferranti call charge indicator which can be reset by depressing a lever mounted across the front of the instrument, the cost of individual calls can be checked, and from other pointers the amount of the quarterly bill can be verified. Basically, the indicator is a simple pulse counter of a type in which a central armature is attracted to field coils when a small pulse of current passes through them. The counter is linked to the armature through a ratchet wheel and pawl so that the units figure is moved forward one step each time that the coil circuit is completed. The pulse counter acts as a slave to the exchange counter, the pulses being fed along the telephone wires on a 50 c/s carrier.

The main development problem was to obtain sufficient sensitivity for satisfactory operation with a current of only 0·6 mA when working at the normal voltage of 45 V, 50 c/s. This was because the pulse is fed along the speech wires during the course of conversation and it is important that the current required by the indicator shall be so small that there is no speech interference. An additional complication was imposed by the fact that the indicator must not record the pulses used for ringing the telephone bell. Ringing pulses are normally of 125 V at a frequency of 25 c/s. To reject these ringing-tone pulses the indicator is tuned to the 50 c/s pulse by means of an inductance coil and two condensers in parallel.

In common with all measuring devices intended for use by the general public, the indicator had to be safeguarded against deliberate falsification of the recorded cost. This was accomplished by introducing a clutch in the drive to the fly-back counter, the clutch being disengaged just before the reset lever releases the spring which operates the heart-shaped resetting cam.

Three different metering pulses are used with durations of 12 seconds for distances over 50 miles, 20 seconds for distances from 35 to 50 miles and 30 seconds for all calls up to 35 miles. Each pulse will cost a subscriber 2d and will cost 3d from a coin box. During the cheap-rate period the trunk calls are charged at two-thirds the full rate and local calls at half the full rate. Details of a new telephone coin box to be used in association with the subscriber trunk dialling system were published in the *Electrical Review* of 13th June, 1958.

The register and translator equipments at Bristol utilise electronic circuits, but the Post Office will order registers and translators using electromagnetic equipment as well as the electronic type depending on the size of the exchange.

Ferranti call charge indicator for subscribers' use

The "GRACE" equipment was designed and developed under the procedure for joint development between the Post Office and the leading manufacturers of telephone equipment in the United Kingdom, i.e. the Automatic Telephone & Electric Co., Ltd., the General Electric Co., Ltd., Ericsson Telephones, Ltd., Siemens Edison Swan, Ltd., and Standard Telephones & Cables, Ltd. The main contractor at Bristol was the Automatic Telephone & Electric Co., Ltd., but the General Electric Co., Ltd., supplied and installed the registers and translators for "GRACE." Subscribers' private meters have been developed in co-operation with Smith's Industrial Instruments, Ltd., and Ferranti, Ltd.

Permanent Magnet Applications

"SOME Industrial Applications of Magnetic Power" was the subject of a paper presented to the Society of Engineers recently by Mr. T. G. Hawker, B.Sc., A.M.I.E.E. He said there was still a substantial application in the swarf treatment field today but the advent during the last 50 years of mass production and automatic control had created a demand for magnetic protection in almost every known industry.

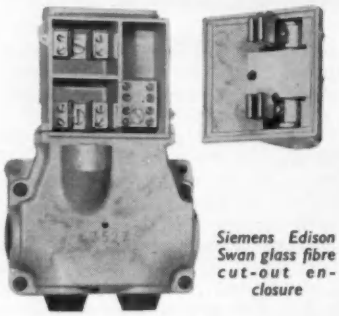
Another type of application was to the reclamation of scrap iron from foundry knock-out plants or the protection of crushers and grinders in coal or mineral plants. In this the overhead separator was suspended above the conveyor. The powerful electro-magnet itself was stationary but the attracted iron was discharged to the side of the conveyor by a rubber and canvas belt surrounding the magnet and carried on driving and idler pulleys. High intensity separation was another specialised application chiefly confined to the treatment of valuable minerals having a magnetic attractive power only a small fraction of that of pure iron. Examples were ilmenite, columbite, wolfram, monazite, etc., all of which were valuable minerals so essential in this modern age of jet propulsion and atomic energy.

Permanent magnet materials now available were tremendously advanced over those of even 15 years ago. Alcomax alloy, having four times the total energy content of the old 35 per cent cobalt steel, was the most widely used and was incorporated in several of the types of separator previously mentioned. It was a grey, hard, brittle, large-grained steel capable of retaining its magnetism indefinitely under normal separation duties. It was unaffected by temperatures up to 550 deg C and by continuous vibration. Charging was simple for straightforward horse-shoe shapes.

NEW ELECTRICAL EQUIPMENT

Glass Fibre Cut-Out Enclosures

A range of service cut-outs and sealing chambers in Premix moulded glass fibre cases is announced by SIEMENS EDISON SWAN, LTD., 155, Charing Cross Road, London, W.C.2. Premix glass fibre is non-hygroscopic and has good non-inflammable and heat resisting properties, with a high electrical insulation resistance, in addition to a very high impact strength. The high resistance to surface tracking enables current carrying parts to be



Siemens Edison Swan glass fibre cut-out enclosure

mounted directly on the mouldings, obviating the use of porcelain or other forms of double insulation.

This new series includes single pole cut-outs rated for 10 to 60 A with rewirable cartridge fuses and 5 to 80 A with h.r.c. cartridge fuses, both provided with entry for cables up to 0·04 sq in cross-sectional area. Double pole cut-outs similarly rated are available in underground and overhead versions, and sealing chambers can be supplied for underground services. There is a choice of terminal and entry arrangements in each instance.

Wire Stripper

The improved H21 wire stripper announced by the Cable Accessories Division of HELLERMANN, LTD., Crawley, Sussex, used to remove insulation from cable ends without damaging the strands, is adjustable to accept conductors up to $\frac{1}{2}$in outside diameter. A spring-loaded quick-opening facility is incorporated, and the handles are coated in coloured p.v.c.

High Temperature Connectors

Two ranges of high temperature plugs and sockets have been produced by the PLESSEY CO., LTD., Ilford, Essex.

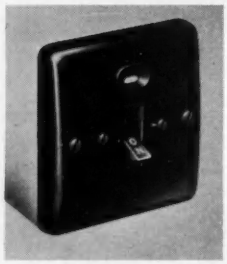
Plessey high temperature connectors

These connectors, developed from the Mark 4 and standard ranges of aluminium plugs and sockets, are suitable for operation at temperatures up to 130 and 150 deg C, meeting both Ministry of Supply and Air Ministry requirements.

20 A Switch

A 20 A flush mounting switch, specially designed to fit the standard B.S. 1363 box, has been produced by GEO. H. SCHOLES & CO., LTD., Wythenshawe, Manchester, 22. This

Geo. H. Scholes "Wylex" 20 A switch with pilot light



latest "Wylex" accessory is a double-pole a.c. switch, available with or without a neon pilot-light, finished in either brown or cream. The non-pilot-light model costs 6s 4d (brown) or 6s 8d (cream), while the price of the pilot-light model is 11s 4d (brown) or 11s 8d (cream). For an extra 4d the switches can be embossed with the words "Cooker," "Water Heater," "Heater," or "Floor Heating."

Indicating Temperature Controllers

Temperature controllers in the model 1036 range introduced by the BRITISH ROTOTHERM CO., LTD., Merton Abbey, London, S.W.19, comprise a 4in dial thermometer with a control unit having a pointer to indicate temperature and two adjustable pointers which can be pre-set to make and/or break contacts at any desired temperature. The standard energising coils operate from a 100 to 440 V 50 c/s supply, and the mercury switch has single pole contacts rated

Rototherm temperature controllers

for 30 A at 240 V a.c. or 1, 2 or 3 pole contacts for 5 or 15 A up to 440 V a.c. The switch contacts can be set normally open, normally closed or for circuit changeover, operating with a minimum differential of ±0·5 per cent of the scale range. The controllers, which are available covering temperature ranges from −20 to +1,000 deg F, are housed in a black stove enamelled case complete with conduit entry.

Radiant Fire Screen

An unusual type of electric fire, in the form of a wrought iron fire screen with a 1 kW rod type element on each side, is now being marketed by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Tyseley, Birmingham, 11. When not in use as a heater, the two panels housing the heating elements can be swung back out of sight and the appliance serves as an ornamental fire screen. Separate switches control each heater. The "Flamenco" radiant fire screen is available in a combination of colours to suit most furnishing schemes. The wrought iron frame-

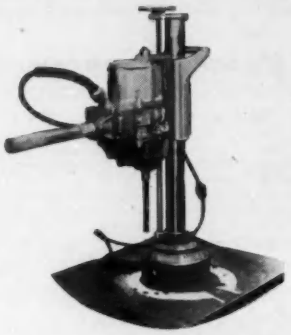
M.E.M. "Flamenco" radiant fire screen

work can be in either cream or black with contrasting coloured back panels. When fully opened out the "Flamenco" measures 35$\frac{1}{2}$in wide by 28$\frac{1}{2}$in high by 8$\frac{1}{2}$in deep. Models are available in the 200/220 and 230/250 voltage ranges and the price is £15 10s plus £3 8s purchase tax in the United Kingdom.

Magnetic Drill Stand

The Mark 2 "Magcodrill" stand manufactured by the MAGNETIC EQUIPMENT CO., LTD., Lake Works, Portchester, Hants, will accommodate up to 1$\frac{1}{2}$in drills. The stand is placed in the approximate drilling position fully magnetised, accurate positioning prior to locking for use being obtained by rotating the drill, at a radius which may be varied by 1in, round the ground steel mast through an arc up to 240 deg. An interlock is provided to prevent the drill being used until the

magnet is energised. The use of a square threaded lead screw reduces the drilling time and permits a 14½in stroke. Stands are available operating from 50 to 250 V a.c. or d.c. supplies,



Magnetic Equipment drill stand

including those for high frequency drills of 200-400 c/s. The total weight of the stand, which has an 8in diameter base and an overall height of 29in, is 60 lb and the basic price is £75.

Old People's Communication System

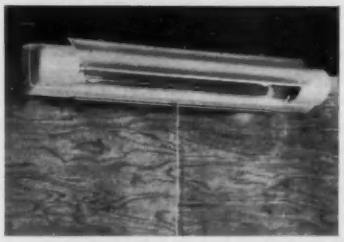
Our attention has been drawn by SMITH BROS. (CAER CONAN) WHOLESALE, LTD., 1-5, Market Road, Doncaster, Yorks., to a system of communication for old people's "neighbourhood" units. It is an alternative to the method by which each dwelling has a push-button operating a bell in the warden's house —a method which has obvious limitations or drawbacks. The new system involves the installation in each house of a small loudspeaker with a three-position key switch marked "Off," "Speak" and Call," with an automatic return from the "Call" to the "Speak" position. All dwellings are connected to the warden's house but there is no communication between the individual dwellings.

On the pressing of the key to the "Call" position a signal is given in the warden's premises; the origin of the call is indicated and the signal is sustained until cancelled by the warden when two-way speech is possible. With the key in the "Off" position the warden may still call any house through the speaker. In the case of the illness or immobility of a tenant the switch can be left in the "Speak" position.

The equipment consists of a specially designed intercom. master unit with sub-units having 15 ohm speech coils. A signal is received on a hand replacement indicator board having the appropriate number of signals, through a line selector switchboard. A warden's main bell and bedroom extension bell are provided. Relay and bell current at 24 V is obtained from a d.c. mains unit. With the sub-unit switch in the "Off" position no speech can be heard in the warden's house but a buzz call can be given, at the sub-unit. Two-way speech is available at the centre "Speak" position. The "Call" position operates the appropriate relay. The main switch is biased to speech from the "Call" position. Any number of lines can be brought to the main control board.

Domestic Striplights

A recent announcement by LINOLITE, LTD., 118, Baker Street, London, W.1, states that two of the company's clip-on striplight fittings, types MH/C and SD.5A/C, are now being offered ready-wired, making them truly portable appliances. To identify them from unwired lamps the suffix "P" has been added to the respective catalogue numbers. One of the new fittings is an all-insulated bed-light, type SD.5A/C/P, designed to clip on to any bed-head up to 1in thick. It has a nylon cord pull switch and is wired with 9ft of ivory coloured flexible. The overall length is 12½in. The finish is in ivory, dove grey or pink with white Perspex diffusing shades. The price, complete with a



Linolite SD.5A/C/P clip-on bed-light

60 W double-ended tubular lamp (284 mm), is £3 10s including purchase tax.

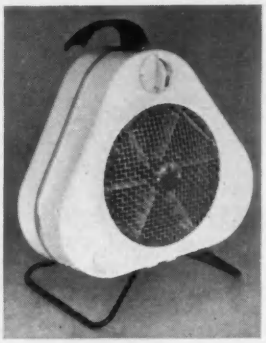
The other fitting (catalogue No. MH/C/P) is designed for clipping on to a dressing table mirror. It has a built-in switch, 9ft of flexible and is finished in similar colours to the bed-light. The price, complete with a 60 W white "Maxtrip 2" lamp, is £1 14s 3d, including tax. To add to the decorative effect of this fitting, "Gaylite" fabric shades in off-white, candystripe red and broad-stripe pink or yellow are available, price 9s 7d each.

New Bylock Appliances

Three new items of domestic electrical equipment have been introduced by BYLOCK ELECTRIC, LTD., South Street, Enfield, Middlesex. The first of these is a cylinder type vacuum cleaner to be known as the "Centurion de Luxe." It is powered by a double insulated 500 W motor and the accessories include a new type double-action turnover carpet nozzle. There is also a floor brush and dusting brush, both in p.v.c. casings, moulded upholstery and crevice nozzles and two chromium-plated slotted extension tubes. A suction control valve is fitted to the cleaner's double-swivelled hose. Rubber buffer strips are fitted and the cleaner is finished in attractive two-tone grey. The price, including purchase tax, is £18 18s.

The second appliance is a two-brush belt-driven floor polisher suitable for use in the smaller household. It is named the "Contemporary" polisher and the machine is provided with a set of burnishing pads and a spare belt. The motor is TV suppressed and an on/off switch is fitted in the handle. The price, including purchase tax, is £10 10s.

The third new item is the "Heatmaster" electric fan heater. Switch settings provide for cool air, half heat (1 kW) or full heat (2 kW) and, in addition, the fan can be switched to high or low speed for each temperature setting. An automatic thermal cut-out is fitted. The heater is finished in primrose yellow with black handle and feet. The feet and handle have been extended to the rear, thus enabling the unit to be laid on its back for direct upward circulation of hot air for clothes drying, etc. The price of the heater, including purchase tax, is £7 19s 6d.



Left: "Heatmaster" fan heater

Below: Bylock "Centurion de Luxe" vacuum cleaner

Financial Section

STOCKS and SHARES

MERGERS within the cable manufacturing industry have been the centre of interest lately in the electrical market of the Stock Exchange. News of British Insulated Callender's Cables' offer to acquire, in exchange for their own shares, the issued capital of Telegraph Construction & Maintenance followed immediately upon the successful conclusion of the similar transaction between Associated Electrical Industries and W. T. Henley's Telegraph Works. The background to these moves was outlined in the B.I.C.C. statement by references to the need for some form of integration and nationalisation to meet the industry's problems of over-equipment and the high costs of research. Elsewhere, the main talking-point for the industrial market has been of course the clash of interests over the future of British Aluminium, and the chances of success for the Tube Investments' bid for the company's shares.

B.I.C.C. and Telcon

Telegraph Construction and Maintenance £1 shares were marked up by about 2s 6d to 35s, as a first reaction to the offer from British Insulated Callender's Cables for a share exchange on the basis of three B.I.C.C. shares for every four of T.C. & M. The former were quoted officially at 49s, and about 6d above that in the market.

In connection with the effect of the proposal upon income, T.C. & M. advise shareholders that they expect trading profits for the second half of the year to be slightly less than those of the first half, and indicate that the distribution for the period would have been limited to a total of 8½ per cent, without a repetition of the extra 1½ per cent paid for 1957. If the scheme is implemented, shareholders accepting the offer will receive a second interim dividend of 4¾ per cent, but not the final dividend to be declared by B.I.C.C. for 1958.

Dividend Prospect

On the assumption that B.I.C.C. maintain their ordinary dividend at the current annual rate of 12½ per cent (and the recent interim report left the impression that this was likely) the proposed share exchange would produce improved income for T.C.M. shareholders accepting it, as well as an advantage in terms of the market value of the shares. They may expect to receive the full particulars of the offer, together with the board's recommendation of acceptance, before the end of this month. For holders of T.C. & M. 5 per cent redeemable preference, a share-for-share exchange into B.I.C.C. 5½ per cent second preference is proposed. The effect of this announcement was to raise the price of the former from 15s 6d to 17s 6d while the B.I.C.C. shares remained at 18s.

Good Features

Although activity generally has been tending to contract a little, the industrial market has continued to pro-

Price Changes in

Company or Board	Nom. Value	Middle price 8th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76½		3	3	3 18 6	76½	72
Brit. Elec. 1974/77	100	73½		3	3	4 1 9	73½	68½
Brit. Elec. 1976/79	100	77		3½	3½	4 10 9	78½	72
Brit. Elec. 1974/79	100	87	−½	4¼	4¼	4 17 9	87½	82¾
Overseas Electric Supply								
Calcutta Elec.	£1	17/6		6·8†	7†	8 0 0†	17/6	15/-
East African Power	£1	23/-	+3d	7½	8	6 19 3	23/-	17/6
Nigerian Elec.	£1	14/6		10	10	13 16 0	17/-	12/6
Perak Hydro-Elec.	£1	13/6		12½	10	14 16 3	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	15/3	−3d	17½	17½	5 14 9	15/6	9/9
Aerialite	1/-	8/3	+6d	51½	54	6 11 0	8/6	5/1
Allen, W. H.	£1	43/9		10	11	5 0 6	43/9	32/9
Anglo-Portuguese Tel.	£1	27/3	+6d	8	9	6 12 0	29/3	19/9
Aron Elec. Ord.	£1	61/3		15	15	4 18 0	61/3	53/-
Assoc. Elec. Ord.	£1	57/6	−1/3	15	15	5 4 3	58/9	46/6
Automatic Tel. & El.	£1	72/6		17	17	4 13 9	72/6	57/-
Babcock & Wilcox	£1	50/9	−6d	15	13‡	5 2 3	54/6	41/9
Bakelite	10/-	21/3		15	15	7 1 3	23/-	17/6
Baldwin, H. J.	2/-	3/-		20	20	—	3/9	2/6
Berry's Electric	5/-	10/-		10	10	5 0 0	10/6	5/9
Bowthorpe Holdings	2/-	11/-		37½	25*	4 11 0	11/-	6/6
British Aluminium	£1	68/9		12	12	3 9 9	77/6	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	37/6	−1/-	25	25	3 6 9	40/-	19/6
B.I. Callender's	£1	49/-	−1/-	12½	12½	5 2 0	52/-	38/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	20/3	19/-
British Tabulating	£1	65/-	+3/-	9	10	3 1 6	65/-	38/6
British Thermostat	5/-	34/9		25	30	4 6 3	35/3	19/9
British Vac. Cleaner	5/-	4/3		10	10	5 17 9*	4/6	2/3
Brook Motors	10/-	43/9		25	24¼*	5 10 9	43/9	27/9
Bulgin, A. F.	1/-	7/-		40	45	6 8 6	7/-	4/7
Bulpitts	5/-	10/6		—	12½‡	5 19 0	10/6	7/3
Burco Dean	5/-	12/3	+6d	20	22½	6 2 6*	12/3	7/9
Cable & Wireless: Ord.	5/-	12/6		10	10‡*	4 0 0	13/-	8/-
4% Loan	100	94½		4	4	4 4 9	94½	89
Chloride El. Storage "A"	£1	65/9		17½	17½	5 6 6	66/3	55/6
Clarke Chapman	£1	64/3		27½	27½	4 5 6	72/6	55/-
Cole, E. K.	5/-	16/3		17½	17½	5 7 9	18/-	15/3
Cossor, A. C.	5/-	6/3	+3d	2½	Nil	Nil	6/-	4/4
Crabtree	10/-	31/6		20	20	6 7 0	32/-	24/4
Crompton Parkinson	5/-	11/6		16	12*	5 4 3	13/6	8/3
De La Rue	10/-	31/3		35	17½*	5 12 0	32/3	20/9
Decca "A"	4/-	32/6	−1/9	43¾	43¾	5 7 9	34/6	21/3
Desoutter	5/-	17/-		32½	18‡*	5 10 3	17/-	13/6
Dewhurst	2/-	9/3		16½	20	4 6 6	9/3	6/9
Dictograph Tel.	2/-	7/-		20	20	5 14 3	7/3	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	10/-		25	12½*	6 5 0	10/9	7/9
E.M.I.	10/-	60/-	+2/9	15	15	—	62/-	27/6
Electrical Components	5/-	9/3		12½	12½	6 15 3	9/9	7/-
Elec. Construction	£1	27/6		8½	8½	6 3 9	28/9	21/-
Elliott-Automation	5/-	17/9		—	10‡	2 16 3	19/9	11/6
Enfield Cable Ord.	£1	16/6		Nil	2½	3 0 6	18/9	10/9
English Electric	£1	58/9		14	14	4 15 3	60/-	44/-
English Electric 3½% Pref.	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	26/3	+6d	22†	12*‡	3 19 6	26/3	17/6
Ever Ready	5/-	21/6	−6d	37½	20*	4 13 0	22/-	13/9
Falk Stadelmann	£1	42/6		17½	15	7 1 3	46/3	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

vide many points of interest. Several electrical share prices reached new heights for the present year. Notable among these were British Tabulating Machine, which added 3s to the previous week's gain of 2s in rising to 65s. American buying was said to account mainly for further sharp advances in E.M.I. and Philips Lamps; the former have been changing hands at over 60s, and Philips reached 82s 6d. Buyers were still keen on domestic equipment shares, and in this field Burco-Dean came in for active attention in advance of the final dividend declaration. Plessey improved to 66s 3d, after publication of the full report containing Mr. A. G. Clark's review.

Electrical Investments

Company or Board	Nom. Value	Middle price 8th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	36/3		12½	10	5 10 3	40/-	29/3
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	21/6	20/3
General Cables	5/-	9/3		30	24	—	11/9	8/3
Greenwood & Batley	£1	57/6		17½	20	6 19 3	57/6	45/-
Hackbridge Holdings	5/-	14/9	+1/-	20	20	6 15 6	14/9	7/6
Hackbridge & Hewittic	5/-	13/6		20	20	7 8 3	14/6	9/7
Head Wrightson	5/-	24/-		22½	17½*	3 13 0	26/-	16/9
Heatrae	2/-	7/6		15	20	5 6 9	7/6	4/-
Holophane	5/-	15/6		37½	22½*	7 5 3	15/6	12/6
Hoover	5/-	52/-	−1/-	50	50	4 16 3	53/6	31/-
I.C.I.	£1	35/9	−6d	10	12	4 9 6*	36/6	23/9
Incl. Combustion	5/-	27/6		22½	25	4 11 0	28/3	19/3
Johnson & Phillips	£1	18/9	+1/3	10	5	5 6 9	25/-	15/-
Lancashire Dynamo	£1	43/9		11	11	5 0 6	43/9	28/6
Laurence Scott	5/-	16/3		15	15	4 12 3	16/9	12/6
Lister, R. A.	£1	30/-	−1/-	10	10	6 13 3	31/6	23/-
London Elec. Wire	£1	60/-		12½	12½	4 3 3	64/6	39/6
Lucas, J.	£1	42/6		7½	10‡	4 14 3	45/-	27/9
Marconi Marine	£1	38/9		10	10	5 3 3	38/9	29/-
Marryat & Scott	2/-	7/6		35	37½	5 0 0*	7/7	5/3
Mather & Platt	£1	50/-	−6d	15	15	4 0 0*	50/6	29/6
Metal Industries	£1	40/-	−1/-	9	14	7 0 0	44/-	22/9
Midland Elec. Mfg.	£1	38/9	+1/3	12½	10*‡	5 3 3	38/9	26/6
Morphy-Richards	4/-	17/6		20	20	4 11 6	19/-	14/6
Murex	£1	53/-	−3d	20	17½	6 12 0	59/3	48/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/3
Oldham & Son	1/-	3/-		17½	17½	5 16 9	3/-	2/3
Parsons, C. A.	£1	52/6		8½	7½*	2 17 3	55/-	43/-
Plessey	10/-	66/3	+1/3	30	30	4 10 6	72/6	55/-
Pye	5/-	15/6	−6d	12½	12½	4 0 9	17/-	10/-
Pyrotenax	5/-	33/9	+1/6	—	27½‡	4 1 6	33/9	27/6
Reyrolle	£1	88/-	−9d	17½	17½	3 19 6	88/9	73/6
Rheostatic	4/-	7/6		12½	12½	6 13 3	8/-	6/-
Richardsons Westgarth	10/-	14/3	−6d	16¾	8¾*	5 17 0	15/9	13/-
Scottish Cables	4/-	11/9		27½	27½	5 8 9*	11/9	7/-
Simon-Carves	5/-	31/3		20	25	4 0 0	31/3	22/6
Smith (England), S.	4/-	11/-		20	12½*‡	4 11 0	12/3	7/-
Southern Areas	£1	12/-	−6d	7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	9/-		15	15	8 6 9	9/3	4/9
Sturtevant	5/-	17/-	−6d	15†	15†	7 13 6	19/6	14/9
Sun Elec.	£1	60/6		25	25	8 5 3	60/6	47/3
Switchgear & Cowans	5/-	8/9		25	22½	6 8 6*	8/9	4/6
Taylor Tunnicliff	5/-	17/9		15	17½	4 18 6	17/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	38/6	32/6
T.C. & M.	£1	35/-	+2/6	8½	8½‡	4 17 3	35/-	20/-
Telephone Mfg.	5/-	4/3		10	10	11 15 3	5/9	4/3
Telephone Rentals	5/-	12/6		12½	12½	5 0 0	13/6	9/9
Thompson (John)	5/-	25/-		25	25	5 0 0	27/-	23/-
Thorn Elec. "A"	5/-	23/9	+6d	17½	17½	3 13 9	23/9	17/-
Thornycroft	£1	23/9		12½	7½	6 6 3	30/9	21/-
Tube Investments	£1	77/6		15	17½	4 10 3	78/9	48/3
Vactric	5/-	27/6	−1/-	25	25	4 11 0	—	—
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	18/3	+6d	20	22½	4 18 9	18/3	11/-
Ward & Goldstone	5/-	34/-		40	25*	3 13 6	34/6	23/6
Watford	2/-	7/6		25	25	5 6 9*	7/6	4/-
Westinghouse	£1	42/6		18	10*	4 14 3	43/9	32/3
West, Allen	5/-	12/6		15	12½*	—	13/-	7/9
Wolf Electric	5/-	7/3		20	10*	6 18 0	9/-	6/9

Mixed Changes

Walsall Conduits and Thorn Electric "A" Shares were among those to improve on their previous top prices of this year; they moved up to 18s 3d and 23s 9d respectively. In the cable group, Pyrotenax enjoyed renewed support and improved to 33s 9d, while Johnson & Phillips picked up to 18s 9d and Hackbridge Holdings to 14s 9d. On the other hand, reactionary tendencies appeared in some of the shares which have lately been especially favoured: part of previous gains was lost by Decca, B.E.T., Hoover, Vactric and Pye. Metal Industries came back 1s further to 40s. Brook Motors were firm at about 43s 9d after the declaration of a final dividend of 20 per cent, the same rate as last year's but payable on capital increased by a one-for-five scrip issue.

Aerialite Prospects

On the cable manufacturing side of the Aerialite business, conditions have become more difficult in recent months, but the chairman indicates in the company's annual report that they would have to deteriorate a good deal more before putting the dividend in jeopardy. The 54 per cent payment for 1957–58 (an increase of 2½ per cent on the previous year's) was covered the better part of three times over by available profits, and Mr. Hargreaves writes that he will be disappointed if this rate cannot be maintained. He gives a good account of progress in the various other fields where Aerialite are active in home and export markets. In the balance sheet, a feature is the growth of reserves to a figure more than four times the nominal ordinary capital of £200,000. The last scrip issue was a share-for-share distribution four years ago. Having risen to 8s 3d, the 1s shares are quoted to yield a fraction over 6½ per cent.

Dictograph Telephones

In his review accompanying the annual report of Dictograph Telephones the chairman said that the current financial year, which runs to August, had begun with a good order book and with satisfactory sales in the opening months. He welcomed the relaxation of Government restrictions and thought it reasonable to expect good results next year. In 1957–58 profits were well maintained, and the dividend of 20 per cent was covered well over twice by the net distributable surplus. The same rate has been paid for many years, but on capital increased by scrip issues of 20 per cent in 1953 and 25 per cent last year. Despite the capitalisation of reserves on these two occasions, the present level of the general reserve, at £225,000, is higher now than ever before. At 7s, the 2s shares offer a yield of 5¾ per cent.

REPORTS and DIVIDENDS

B.I.C.C. and Telcon.—The Telegraph Construction & Maintenance Co., Ltd. ("Telcon"), announced last week that a conditional offer had been received from British Insulated Callender's Cables, Ltd. (B.I.C.C.), to purchase the whole of the issued capital of Telcon. The terms are as follows:—

Holders of Telcon 5 per cent £1 redeemable preference shares will be offered a one-for-one exchange in B.I.C.C. 5½ per cent £1 second cumulative preference shares. The Telcon preference shares will be sold cum all dividends accruing after 31st December, 1958, and the B.I.C.C. preference shares allotted will rank for the full half-yearly dividend to 30th June, 1959.

The offer for the Telcon ordinary shares is the issue of three B.I.C.C. £1 ordinary shares for every four £1 ordinary shares in Telcon. Telcon ordinary shares would be sold cum all future dividends except a second interim dividend of 4¼ per cent in respect of the year to 31st December next, which the directors of Telcon will pay as soon as the offer becomes unconditional. The B.I.C.C. ordinary shares to be allotted will rank *pari passu* with the existing ordinary stock of B.I.C.C. except that they will not participate in the final ordinary dividend to be declared by B.I.C.C. in respect of the year to 31st December next.

The offer is conditional upon the acceptance by the holders of not less than 90 per cent of both the redeemable preference and ordinary shares of Telcon (or such smaller percentage as B.I.C.C. may agree) by 7th February next. The offer may be extended to 31st March. The offer is also conditional upon the passing of resolutions to increase the authorised capital of B.I.C.C. by the creation of not less than 500,000 additional 5½ per cent second preference shares of £1 each; the granting by the Council of the Stock Exchange, London, of permission to deal in and quotation for the preference and ordinary shares to be issued by B.I.C.C.; and the granting by the Capital Issues Committee of its consent to the issue of such preference and ordinary shares in B.I.C.C.

In deciding to recommend this offer, the directors of Telcon have reviewed the rate of distribution which they could propose for 1958. On the basis of current figures they have estimated that trading profits for the second half of 1958 will be slightly lower than those for the first half. Although there will be exceptional credits this year of approximately £125,000, the directors are of the opinion that the overall picture of current trading conditions does not justify them in repeating the special additional cash bonus of 1½ per cent which was paid for 1957. They therefore consider that the total distribution to be recommended for 1958 would have been a dividend of 7½ per cent, plus a cash bonus of 1 per cent. If the offer is accepted the directors propose to pay as soon as it becomes unconditional a second interim dividend of 4¼ per cent actual, less income tax, after which no further dividend for 1958 will be paid.

In its statement issued last week, B.I.C.C. says that there has over the last few years been a small but growing co-operation between B.I.C.C. and Telcon, particularly in certain countries overseas and on specific technical problems, which has been of mutual benefit. Having regard to the conditions now applying and likely to apply in their respective fields of activities, the directors of both companies are convinced that a unification of their interests is desirable. Telcon will continue as a separate entity within the B.I.C.C. group. The statement goes on:—"There is undoubtedly a need for some form of integration and rationalisation within the cable-making industry to meet the problems of over-equipment and the substantial costs of keeping abreast of modern technical developments."

Pifco Holdings, Ltd.—The annual meeting was held on 3rd December, Mr. A. D. Webber (chairman and managing director) presiding. In his review of the year, which had been previously circulated, the chairman said that as producers and distributors of a wide variety of electrical appliances, electric blankets and health lamps for domestic use, they had faced many problems in the past year. By the end of 1957 it became evident that the inflationary climate of recent years was less intense and that a deflationary atmosphere was being encouraged with the effect that the results of the last quarter of the year under review were not progressive. Additionally, the difficulties of export increased due to the desire of many markets to encourage domestic manufacture and the application of import restrictions. Yet signs were not wanting that this recession was not a major one and trade was now showing more healthy signs. In the last few months there had been a marked recovery and present indications were not unfavourable for the winter season. They had recently introduced some new products and others were in the development stage.

British Aluminium Co., Ltd.—The board of this company has given shareholders details of the negotiations with the Aluminum Company of America upon the offer by "Alcoa" for the 4,500,000 unissued shares of British Aluminium, representing a third of the authorised capital. The price offered is 60s a share, i.e., a total payment of £13½ million, of which one-third would be provided immediately and the rest by the end of 1961. The American company has undertaken not to use greater voting power than that represented by its acquisition under the terms of the offer; that is, it would not exercise rights attached to any further purchase of British Aluminium shares.

The offer made to British Aluminium shareholders by a concern jointly owned by Tube Investments, Ltd., and Reynolds Metals (U.S.A.) of shares and cash for their holdings is said to be worth 78s a share. At a Press conference last week Lord Portal, chairman of British Aluminium, said that the Alcoa offer would provide the company with large fresh funds on favourable terms which would not be the case under the offer by Tube Investments. The present quotation of the shares is round about 71s.

Scottish Cables, Ltd., has declared an interim ordinary dividend of 6 per cent on capital increased by a scrip bonus issue of five for seven. This compares with 7½ per cent on the old capital. The directors state that the increased amount now being distributed is with a view to obtaining a more equitable distribution of dividend throughout the year and does not imply any increase in the year's total distribution.

Turner & Newall, Ltd.—The group trading profit for the year to 30th September last is £11,727,116, as compared with £12,873,321 for 1956-57, to which is added an additional profit of a subsidiary and miscellaneous income, making a total of £13,187,711. Taxation absorbs £7,214,187 and the net profit amounts to £5,973,524 (against £5,857,229). General reserve receives £2,280,000 and it is proposed to pay a final dividend of 10 per cent, making 15 per cent for the year. For the previous year the total payment was 17½ per cent, of which the interim dividend was paid on smaller capital. The balance carried forward is £820,024 (against £650,132 brought in).

Brook Motors, Ltd., reports group profits for the year ended 30th September last of £829,481, as compared with £815,585 for the preceding year. Taxation absorbs £425,874, and the net balance is £403,607 (against £380,388). It is proposed to pay a final dividend of 20 per cent on the increased ordinary capital, again making 25 per cent for the year.

Hick, Hargreaves & Co., Ltd., are paying an interim dividend of 4 per cent (against 5 per cent) on larger capital.

Renold Chains, Ltd., has announced an interim dividend of 3 per cent (unchanged) on larger capital.

New Companies

Birlec-Efco (Melting), Ltd.—Registered 24th November. Capital £150. To design, buy, sell, import, export, manufacture, let on hire or otherwise deal in electric or other furnaces for melting, smelting, etc. Directors: G. P. Tinker, T. G. Tanner, J. H. Crossley,

P. F. Hancock, F. S. J. Leigh, J. C. Howard, D. le S. Campbell and J. A. Monks. Solicitors: Lovell, White & King, 1, Serjeants' Inn, Fleet Street, E.C.4.

Entryphone Co., Ltd.—Registered 6th November. Capital £1,000. Telephone, electrical, radio, radar, television, electronic and mechanical engineers, etc. Directors: G. D. Ashbee and Mrs. Diana R. Ashbee. Regd. office: 84, Walton Road, Woking.

W. W. Bleasdale & Co. (Accrington), Ltd.—Registered 6th November. Capital £1,000. Electricians, electrical contractors, electrical and mechanical engineers, television and radio engineers, etc. Directors: W. W. Bleasdale, J. Bleasdale and J. Pollard. Regd. office: 7, Blackburn Road, Accrington, Lancs.

Alton-Electro (High Vacuums), Ltd.—Registered 20th November. Capital £3,000. Designers, manufacturers of and dealers in cathode ray tubes, etc. Directors: A. A. J. Betton and R. H. Aldous. Regd. office: Cray Works, Leesoms Hill, St. Mary Cray.

Elvatron Electricals, Ltd.—Registered 20th November. Capital £100. Electrical and mechanical engineers, manufacturers of and dealers in electrical equipment and apparatus, etc. W. L. W. Ludekens is the first director. Regd. office: 4, Cavendish Place, W.1.

Wallis, Tomlin & Co., Ltd.—Registered 30th October. Capital £3,000. Manufacturers and repairers of and dealers in artificial lighting apparatus, electrical plant, radio and television sets, etc. Directors: E. Wallis, Mrs. Margaret E. Wallis and P. A. Tomlin. Regd. office: 15, Broad Street, Lyme Regis, Dorset.

D.J.P. Telephones, Ltd.—Registered 17th November. Capital £100. Manufacturers of and dealers in manual, automatic, electronic and push-button telephone equipment, etc. Directors: D. J. de L. O'Kelly and F. J. O'Kelly. Regd. office: 96, Great Titchfield Street, W.1.

Laycock Electric, Ltd.—Registered 30th October. Capital £6,000. Electrical engineers, general electrical and refrigeration installation contractors, manufacturers of and dealers in radio and television sets, etc. Directors: D. K. Laycock, S. Laycock, Mrs. Kathleen M. Laycock, S. G. Raine and T. J. Sargeant. Regd. office: 11, Wheelgate, Malton, Yorks.

Increases of Capital

Allen West & Co., Ltd.—Increased by £500,000 in 5s ordinary shares, beyond the registered capital of £2,500,000.

Simms Motor Units, Ltd.—Increased by £200,000, in £1 ordinary shares, beyond the registered capital of £2,500,000.

British Vacuum Cleaner & Engineering Co., Ltd.—Increased by £600,000 in 5s ordinary shares, beyond the registered capital of £550,000.

Switchgear & Cowans, Ltd.—Increased by £500,000 in 5s ordinary shares, beyond the registered capital of £250,000.

Honeywell Controls, Ltd.—Increased by £35,000 in £1 ordinary shares, beyond the registered capital of £140,000.

Kango Electric Hammers, Ltd.—Increased by £190,000, in 4s ordinary shares, beyond the registered capital of £60,000. Converted into a public company on 14th October, 1958.

Bankruptcies

S. W. Morley, trading as Morleys, at Bow Street, Rugeley, Staffs., as a radio and electrical engineer.—Last day for receiving proofs for dividend 16th December. Trustee, Mr. W. H. Meredith, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

B. Landau, 60, Myrdle Street, Commercial Road, E.1, electrical engineer, lately carrying on business at 401, Commercial Road, E.1, and formerly carrying on business at 31, Cannon Street Road, E.1, both in the name of Landau Electrical Co., as a retailer of electrical goods and as electrical contractors.—Application for discharge to be heard on 23rd January at Bankruptcy Buildings, Carey Street, London, W.C.2.

L. Peel, of and lately carrying on business at 216, Low Lane, Horsforth, near Leeds, electrical engineer.—Last day for receiving proofs for dividend 17th December. Trustee, Mr. J. L. Williams, 3rd Floor, Pearl Chambers, East Parade, Leeds, 1, Official Receiver.

Liquidations

Etherington & Partners, Ltd., Room 15a, Grosvenor Mansions, 82, Victoria Street, London, S.W.1, electrical manufacturers, wholesalers, factors, etc.—Liquidator, Mr. A. T. Cheek, Inveresk House, 346, Strand, London, W.C.2, released 19th November.

W. Westover & Co., Ltd., Ultra Works, River Road, Barking, Essex, electrical and general engineers.—Liquidator, Mr. A. T. Cheek, Inveresk House, 346, Strand, London, W.C.2, released 26th November.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

MONDAY, 15th DECEMBER

Brigg.—Angel Hotel, 6.45 p.m. I.E.E. Sheffield Sub-Centre. Discussion on "Electrical Maintenance Problems in Factory and Supply Systems."

Chester.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Electricity in Modern Commercial Horticulture," by C. A. Cameron Brown and A. W. Gray.

Gloucester.—Technical College, Brunswick Road, 6 p.m. I.E.E. Western Centre. "Electrification of the U.K.A.E.A. Industrial Group Factories," by J. W. Binns and W. J. Outram.

Ipswich.—Electric House, 7.15 p.m. Ipswich and District Electrical Association. Film show.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. "The Acoustic Design of Talks Studios and Listening Rooms," by C. L. S. Gilford.

Newcastle-upon-Tyne. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurement Group. "Magnetic Tape for Data Recording," by Dr. C. D. Mee.

Stafford.—Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Use of Steel-Tank Mercury-Arc Invertors for Generating Medium Frequencies for Induction Heating," by D. L. Smart and J. J. L. Weaver.

TUESDAY, 16th DECEMBER

Aldershot.—Red Cross Hall, High Street, 7.30 p.m. A.S.E.E. Aldershot and Districts Branch. "Relays and Automatic Control in Engineering," by Dr. W. L. Stern.

Canterbury.—County Hotel. A.S.E.E. East Kent Branch. Social evening.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Standardisation of Control Facilities for the British Grid: Communications, Indications and Telemetering," by P. F. Gunning; and "The Development of Communication, Indication and Telemetering Equipment for the British Grid," by G. A. Burns, F. Fletcher, C. H. Chambers and P. F. Gunning.

Glasgow.—39, Elmbank Crescent, C.2, 6.30 p.m. Institution of Engineers and Shipbuilders in Scotland. "Applications of Digital Computers," by Dr. D. C. Giles.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Discussion on "Modern Control Techniques on the Railways," opened by W. J. Webb and L. A. Ginger.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. "Hamilton Falls Hydro-Electric Scheme," by E. N. Webb.

Newcastle-upon-Tyne.—Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. "Heat Treatment and Hardening."

TUESDAY, 16th DECEMBER, and WEDNESDAY, 17th DECEMBER

London.—Church House, Great Smith Street, S.W.1. Institute of Metals Powder Metallurgy Joint Group. Symposium "Powder Metallurgy of Ceramic-Metal Materials."

WEDNESDAY, 17th DECEMBER

Glasgow.—39, Elmbank Crescent, 7 p.m. I.E.E. South West Scotland Sub-Centre. "Standardisation of Control Facilities for the British Grid: Communications, Indications and Telemetering," by P. F. Gunning; and "The Development of Communication, Indication and Telemetering Equipment for the British Grid," by G. A. Burns, F. Fletcher, C. H. Chambers and P. F. Gunning.

London.—Savoy Place, 5.30 p.m. I.E.E. Supply Section. "The Design and Performance of the Gas-Filled Cable System," by E. P. G. Thornton and D. H. Booth.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "A Vidicon Camera for Industrial Colour Television," by I. J. P. James.

Sheffield.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "A New Cathode-Ray Tube for Monochrome and Colour Television," by Dr. Ing. D. Gabor, Dr. P. R. Stuart and P. G. Kalman.

Wolverhampton.—Chamber of Commerce, District Bank Chambers, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Power Factor Correction Equipment," by R. S. Stevens.

THURSDAY, 18th DECEMBER

Chelmsford.—Hoffman's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Power Plants for High-speed Flight," by Dr. E. S. Moult.

Glasgow.—39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Design and Construction of Precision Toroidal Potentiometers for Data Transmission," by H. J. Arnott.

London.—At the Institute of Marine Engineers, 76, Mark Lane, E.C.3, 2.30 p.m. Diesel Engineers' and Users' Association. "Report on Heavy Oil Engine Working Costs and Performances, 1957/58," and an informal discussion on "Operating Problems," followed by "Modern Trends in High-Speed Diesel Engines," by L. D. E. Brodie.

Southampton.—Polygon Hotel, 7 for 7.30 p.m. I.E.E. Southern Centre. Annual dinner-dance.

FRIDAY, 19th DECEMBER

Edinburgh.—The University, Drummond Street, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Design and Construction of Precision Toroidal Potentiometers for Data Transmission," by H. J. Arnott.

Halifax.—Crown Hotel, Horton Street, 8 p.m. A.S.E.E. Halifax Branch. Annual dinner.

Leeds.—Parkway Hotel, Otley Road. A.S.E.E. Leeds Branch. Dinner-dance.

Liverpool.—Exchange Hotel, Institution of Heating and Ventilating Engineers, Liverpool and District Branch. Ladies' evening.

London.—1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. James Clayton Lecture, "The Hydraulic Turbine in Evolution," by M. P. Danel.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

22003. Dolder, K. T., and Klemperer, O. E. H.—Circuit arrangements embodying electron lenses. 26th July, 1955. (805691.)

28410. English Electric Co., Ltd.—Waveguides. 23rd September, 1955. (805692.)

1955

8449. Amp, Inc.—Electrical connectors and methods of manufacturing same. 23rd March, 1955. (805634.)

10205. Telefunken G.m.b.H.—Method for the production of semi-conductor devices of n.p.n. or p.n.p. type. 7th April, 1955. (805493.)

10753. Telefunken G.m.b.H.—Electric current convertors, especially for automobile radio receivers. 14th April, 1955. (805681.)

11929. English, F. G. S.—Portable electric lamps. 13th April, 1956. (805495.)

13243. Sperry Rand Corporation.—Directional reference system. 6th May, 1955. (805535.)

14603. Standard Telephones & Cables, Ltd.—Telegraph switching system. 20th May, 1955. (805694.)

14941. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 14th May, 1956. (805756.)

16831. English Electric Valve Co., Ltd.—Electron gun structures for cathode-ray tubes. 6th March, 1956. (805785.)

20589. Cinch Manufacturing Corporation.—Holders for electrical devices, assemblies including same and contacts for such holders. 15th July, 1955. (805661.)

22098. Brookhirst Switchgear, Ltd., and Butterworth, E. M.—Snap-action mechanisms. 30th July, 1956. (805662.)

23795. Revo Electric Co., Ltd.—Electronic tachometers. 31st October, 1956. (805498.)

24161. Thorn Electrical Industries, Ltd.—Street lighting lanterns. 16th August, 1956. (805758.)

24365. Farbenfabriken Bayer A.G.—Process of insulating electrical apparatus and an insulating composition therefor. 24th August, 1955. (805557.)

24603. Foster Wheeler, Ltd.—Water tube boilers. 27th August, 1956. (805483.)

1956

348. Sylvania Electric Products, Inc.—Electrodeposition of zinc. 4th January, 1956. (805762.)

2500. General Electric Co., Ltd., and Harrold, A. E.—Electric capacitors. 25th January, 1957. (805702.)

6024. Welwyn Electrical Laboratories, Ltd., and Browning, J.—Electrical resistors. 27th February, 1956. (805792.)

6489. Dowty Equipment, Ltd.—Snap-action electric switches. 28th February, 1957. (805683.)

6907. General Electric Co., Ltd., and Bown, G. C. S.—Television apparatus. 5th March, 1957. (805502.)

10772. Curtiss-Wright Corporation.—Apparatus for reshaping voltage waveforms. 9th April, 1956. (805795.)

13374. Marconi's Wireless Telegraph Co., Ltd.—Switching arrangements for coaxial cables. 18th February, 1957. (805684.)

16918. Siemens-Schuckertwerke A.G.—Magnetically soft sintered bodies. 31st May, 1956. (805710.)

18760. Companhia Portuguesa Radio Marconi.—Apparatus for designating which of a plurality signal input channels carries the signal of highest value of magnitude. 18th June, 1956. (805799.)

24311. Telefonaktiebolaget L. M. Ericsson.—Two-pole rotary electric motor. 8th August, 1956. (805685.)

24449. Sperry Rand Corporation.—Magnetic printers. 9th August, 1956. (805610.)

26536. Compagnie Générale de Télégraphie sans Fil.—Transmission time correcting devices. 30th August, 1956. (805509.)

26591. Power Frequency Heating, Ltd.—Electromagnetic induction heaters. 22nd November, 1956. (805715.)

27946. Demag-Zug G.m.b.H.—Electric motors with displaceable armature. 12th September, 1956. (805801.)

29398. General Electric Co.—Radiant energy image intensifier systems. 26th September, 1956. (805802.)

30714. Standard Telephones & Cables, Ltd.—Telecommunication exchange systems. 9th October, 1956. (805803.)

31192. General Electric Co.—Stationary induction electrical apparatus. 12th October, 1956. (805772.)

32174. Marie, G. R. P.—Electromagnetic waveguide couplings. 22nd October, 1956. (805510.)

32780. Metallgesellschaft A.G.—Collecting electrodes for electrostatic precipitators. 26th October, 1956. (805720.)

32982. Compagnie Générale d'Electricité.—Three-phase magnetic circuits. 29th October, 1956. (805721.)

33444. Telefonaktiebolaget L. M. Ericsson.—Electric multipolar two part connecting devices. 1st November, 1956. (805675.)

38867. Siemens & Halske A.G.—Circuit arrangements for automatically regulating sidetone damping in telephone stations. 20th December, 1956. (805726.)

1957

306. Philips Electrical Industries, Ltd.—Electric arc welding apparatus. 3rd January, 1957. (805677.)

1644. Compagnie Générale de Télégraphie sans Fil.—Electromagnetic wave filters. 16th January, 1957. (805515.)

3967. United-Carr Fastener Corporation.—Electrical socket connectors. 5th February, 1957. (805728.)

6845. Armstrong Whitworth Aircraft, Ltd., Sir W. G.—Multiple electrical switch. 1st March, 1957. (805657.)

13061. Busch-Jaeger Dürener Metallwerke A.G.—Screw type automatic electric cut-out. 24th April, 1957. (805480.)

15403. General Motors Corporation.—Thermally-operable electric switches. 15th May, 1957. (Addition to 760784.) (805811.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 19th December.

Pye (design). No. 752,181. Class 7. Electric motors (not for land vehicles), alternators, dynamos, generators, welding machines, magnetos and turbines (not for land vehicles).—Pye, Ltd., Radio Works, St. Andrew's Road, Cambridge.

No. 762,244 (design). Class 9. Aerials, radio and television amplifiers, electrical interference suppression devices, holders for electric fuses and thermionic valves, printed electrical circuits, lightning arrestors, transmission lines for aerials; and signal attenuators, terminals, plugs, sockets, connectors, fuses, switches, cut-outs, filters and signal transformers, all being electric.—Belling & Lee, Ltd., Great Cambridge Road, Enfield, Middx.

Rubellit. No. 770,433. Class 9. Electric storage batteries; casings being parts of such batteries; and parts made of rubber.—Accumulatoren-Fabrik Akt.-Ges., Hagen, Westphalia, Germany. Address for service, c/o Edward Evans & Co., Chancery House, 53-64, Chancery Lane, London, W.C.2.

Regremo. No. 776,447. Class 9. Electrical installations for use in controlling the operation of the motors of printing machines, and parts; and insulated cables and insulated wire, all being electric.—A. C. Dibley & Co., Ltd., 72, Granville Road, Cricklewood, London, N.W.2.

Colorator. No. B778,138. Class 9. Photoelectric apparatus for use in sorting articles by colour selection.—Creighton & Partners, Ltd., Gromax Works, Minerva Road, Park Royal, London, N.W.10.

Solano. No. 779,373. Class 11. Electric heaters incorporating fans.—Berry's Electric, Ltd., 85 and 86, Newman Street, Oxford Street, London, W.1.

Modeq. No. 780,388. Class 11. Electric clothes drying apparatus and electric heating apparatus.—Modern Equipment Co., Ltd., 21, Monmouth Street, Bridgwater, Somerset.

CATALOGUES AND LISTS

DOMESTIC APPLIANCES.—Illustrated and priced 76-page catalogue covering domestic electrical appliances, radio and television.—**Kerry's (Great Britain), Ltd.,** Warton Road, Stratford, London, E.15.

FANS.—25-page catalogue (V.1089) dealing with the company's "Aerofoil" fans, together with a 36-page publication (V.1089T) containing selection tables with dimensions and weights.—**Woods of Colchester, Ltd.,** Colchester, Essex.

MOTOR CONTROL GEAR.—Illustrated leaflet (1114) dealing with control equipment for pumping and sewage drives.—**Brookhirst Switchgear, Ltd.,** Northgate Works, Chester.

MOTORS.—Broadsheet summarising the range of special purpose fractional horsepower motors manufactured by the company.—**Croydon Engineering Co., Ltd.,** Commerce Way, Purley Way, Croydon.

STREET LIGHTING.—Three catalogues illustrating various street lighting lanterns for post and wall mounting and a leaflet dealing with timber lamp standards.—**Siemens Edison Swan, Ltd.,** 38-39, Upper Thames Street, London, E.C.4.

SWITCHGEAR.—Four leaflets describing cooker control units, 30 and 60 A a.c. switches, pilot lamp switches and busbar chambers, together with two price lists giving revised figures for the company's 5, 13 and 15 A accessories.—**Bill Switchgear, Ltd.,** Aston Lane, Perry Barr, Birmingham, 20.

TELEPHONE SYSTEM.—26-page pamphlet illustrating and describing the company's type SOJ-12(D) twelve circuit open wire carrier telephone system, giving details of applications, performance and maintenance.—**Standard Telephones & Cables, Ltd.,** Transmission Division, North Woolwich, London, E.16.

TELEVISION.—Folder describing closed-circuit industrial television equipment and giving details of applications in various fields of industry.—**E.M.I. Electronics, Ltd.,** Hayes, Middlesex.

WINDING MACHINE.—Illustrated leaflet dealing with the Aumann drum winding machine type TW.—**R. H. Cole (Overseas), Ltd.,** 2, Caxton Street, Westminster, London, S.W.1.

WIRING ACCESSORIES.—84-page illustrated and priced catalogue covering the "MK" range of wiring accessories, with a separate numerical price list (HCP.400).—**M.K. Electric, Ltd.,** Wakefield Street, Edmonton, London, N.18.

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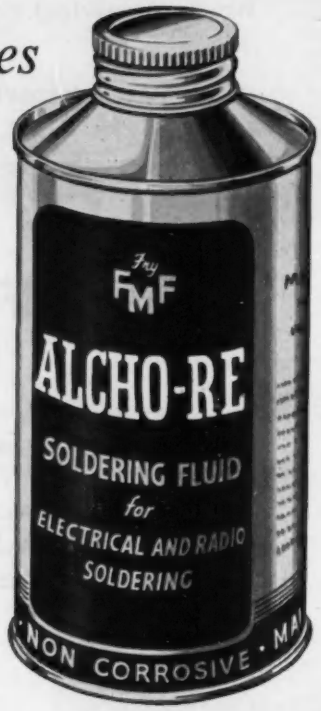

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T.170

GENERATION and DEVELOPMENT

Further Rise in Appliance Sales

Area Boards' sales of electrical appliances reached new high levels in October, the first full month of the latest concessions in hire-purchase terms. As the accompanying table shows, all the main categories of equipment were in greater demand. Compared with the previous month, the largest increase was in cooker sales (September 22,922; October 30,834). Sales of both immersion heaters and refrigerators showed a seasonal decline but were substantially greater than a year ago. The figures given in the return, issued by the Electricity Council, represent, of course, only a part of the total sales throughout the country.

AREA BOARDS' SALES OF APPLIANCES

Type of Appliance	Sales in Month ended 31st October, 1958		Sales in 12 Months ended 31st October, 1958	
	Total	% change over corresponding period of previous year	Total	% change over corresponding period of previous year
Cookers	30,834	+51·2	241,342	+ 5·6
Water Heaters—				
Immersion	11,789	+35·1	160,512	+15·0
Storage	4,979	+38·0	46,324	+11·4
Wash Boilers	7,952	+15·7	80,782	+ 2·2
Washing Machines	9,143	+33·9	78,987	+ 7·9
Refrigerators	4,203	+68·1	64,138	+30·6

R.D.C. Presses for Underground Cable

Sedgefield R.D.C. is adhering to its request to the North Eastern Electricity Board that a cable supplying electricity to Sedgefield Secondary Modern School should be placed underground. The Council pointed out that as the school was on high ground overhead wires would be seen from all sides. It added that its policy was for all cables to be underground unless there were exceptional circumstances.

Higher Charges in the Midlands

Electricity charges in the Midlands are to be increased from the first normal meter reading after 31st December. Domestic, commercial and industrial consumers are affected. In addition to a ½d increase in the rate for the first block under the domestic tariff, a second block at 1½d is to be introduced. Announcing the new tariffs, the chairman, Mr. W. S. Lewis, said the adjustments had been forced on the Board by increases in costs outside its control, principally in coal prices, and a decision that a greater contribution must be made out of revenue to the capital needed for the industry's big development programme, including the nuclear power stations.

The Board's decision to increase its charges was criticised by Mr. E. Haynes, a city councillor, at a meeting of the T.U.C. Midland Regional Advisory Committee. He said the Board had discussed the question of increased tariffs with the Electricity Consultative Council and the Council had decided that it could not support the proposals. "It was never the intention that a Consultative Council should be just a machine to be informed of what was to take place," he declared. It was a machine set up so that the Board could get the opinions of consumers and the Board had just flouted the Council on this issue, said Mr. Haynes.

Dispersal of Power Station Emissions

Full confirmation of the efficacy of the tall chimney, emitting high velocity, high-temperature gases, in attaining gas dispersal even under severe fog conditions has been obtained. Both visual and photographic surveys of the top of the recent fog blanket which formed over the London area have shown that power station chimneys are capable of producing a thermal draught sufficiently strong to penetrate fog layers at least 750ft above ground level and that, above the top of the fog, the gases disperse into the upper atmosphere in the normal manner.

In order to carry out the investigation the Central Electricity Generating Board chartered an aircraft from Fairey Air Surveys, Ltd. Special navigation equipment was installed to permit safe flying in the necessarily poor conditions and to allow the individual power stations to be picked out. This task was eased by the provision of local ground-air communication, and in one case, that of Brunswick Wharf, by the emission, over a specified period of time, of red and black smoke from the chimney stacks.

It is claimed that the results have shown that no contribution to ground fog conditions is made by tall chimneys emitting hot, high-velocity gases, but it was noticed that the chimney plume from Bankside power station was ineffective in penetrating the fog layer. This results from the use of the gas-washing plant, which causes a relatively cool emission.

The Research Department of Fairey Air Surveys provided great assistance in devising the necessary photographic and survey techniques, and full co-operation was extended in the exercise by the London Airport traffic and navigational control authorities and the Meteorological Section.

OVERSEAS

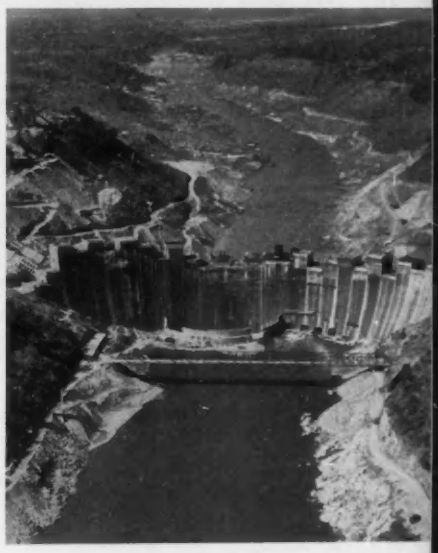
Nuclear Plant Offer to British Guiana

Reuter reports from Georgetown that the Government of British Guiana has received an offer from the Mitchell Engineering Group to provide a nuclear power plant of up to 21·5 MW, at a price of about $14 million. The Group claims that the plant could produce electricity at half the present cost of the Colony's supply. The report says that the Government is already negotiating with the Demerara Electric Co. on an $11 million scheme to meet the demand for electricity.

Kenya Extends Mains Distribution

The East African Power & Lighting Co., Ltd., is to extend its mains distribution system in Kenya. Reporting this, Barclays Bank D.C.O. says that Kericho and Nandi Hills, the main tea-growing areas, are among those which will have mains electricity for the first time. Other important areas will be linked, thus relieving the pressure on their individual generating systems.

Final plugging of the 400ft high Kariba Dam wall in Rhodesia began last week. The result will be the creation of an artificial lake more than 2,000 sq miles in extent. The whole project, costing £113 million, will provide 1,200 MW of additional power for the Central African Federation



CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Trust of South Australia, Adelaide. 3rd March. 60 MW turbo-alternator plant for Port Augusta "B" power station. (See this issue.)

Ayr.—County Council. Trunk road lighting equipment. (See this issue.)

Azores.—Federation of the Municipalities, Ponta Delgada. 19th January. Two 1,500 kW generating plants. (E.S.B. 29900/58. Ten/36151.)*

Durham.—County Council. Electrical installation at Durham Gilesgate New Modern School. (See this issue.)

Formosa.—Central Trust of China, Taipei. 5th January. Mobile transmitters and receivers. (E.S.B. 29669/58/I.C.A. Ten/36146.)*

Greece. — State Procurements Service, Athens. 18th December. Cable. (E.S.B. 29865/58. Ten/36144.)*

Civil Aviation Service, Athens. 20th December. Private automatic telephone exchange. (E.S.B. 29861/58. Ten/36142.)*

Ilford.—Borough Council. 5th January. Electric cable (Form No. 7), and lamps (Form No. 16), for year to 31st March, 1960. Borough engineer, Town Hall.

Ilkley.—U.D.C. 29th December. Trunk road lighting equipment. (See this issue.)

India.—Director General Supplies and Disposals, New Delhi. 30th December. Cable, jointing material, jointing box, cable terminating equipment, gas pressure alarm equipment and cable testing equipment. (See this issue.)

Bombay State Electricity Board. 31st December. Switchgear, power transformers, cables, etc., for supplying power to Kanhan. (E.S.B. 29741/58. Ten/36152.)*

Iran.—Imperial Air Force, Teheran. 10th January. Two 60 kW diesel generators. (E.S.B. 29527/58. Ten/36094.)*

Korea.—Government Office of Supply, Seoul. 16th January. One 150 kW generating set, lighting equipment and fittings. (E.S.B. 29137/58/I.C.A. Ten/36044.)*

Manchester.—Corporation. 29th December. Electrical installations in 90 dwellings. (See this issue.)

Preston. — Corporation. 12th January. Electrical installation in new fire station in Blackpool Road. Borough engineer, Municipal Buildings.

Romford.—Borough Council. 3rd January. Electric lamps, including lamps for street lighting maintenance (Schedule M.26), for one year. Borough engineer, Town Hall.

South Africa.—Union Tender and Supplies Board, Pretoria. 8th January. Independent sideband generating equipment and radio transmitters. (E.S.B. 29495/58. Ten/36082.)*

Durban Corporation. 16th January. Electronic a.c. voltage stabiliser. (E.S.B. 29516/58. Ten/36075.)* Thirty 300 kVA transformers. (E.S.B. 29511/58. Ten/36073.)* Low voltage electric fuse carriers. (E.S.B. 29515/58. Ten/36150.)*

Sudan.—Sudan Light & Power Co., Ltd., Khartoum. 31st January. Transformers. (See this issue.)

Sudan Gezira Board Supplies Department, Barakat. 6th January. Equipment for mobile radio communication system. (E.S.B. 29677/58. Ten/36101.)*

Swansea.—Corporation. 17th January. Two pumping sets, with control gear, switches, switchboard, etc. Caswell Valley sewerage scheme. R. D. Moody, borough engineer, The Guildhall.

Wanstead and Woodford.—Corporation. 2nd January. Electric lamps (Schedule 12), for one year. Borough engineer, Municipal Offices, Woodford, E.18.

Willesden.—Corporation. 10th January. Electrical equipment, cables, conduit and lamps for the year ending 31st March, 1960. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Glasgow.—Housing Committee. Washboilers (£9,280).—G.E.C.

Newcastle-on-Tyne.—City Council. Two six-ton electric travelling cranes for Newcastle Quay (£42,440).—Cowans Sheldon & Co.

Education Committee. Electrical installation in Moorlands Hall of Residence (£1,990).—G. S. Akinhead & Co.

Richmond (Surrey).—Corporation. Recommended. Rewiring of electrical installation at Richmond County Girls' School (£1,588).—Requirements Electrical & Engineering.

South Shields. — Education Committee. Electrical installation in new wing at the Marine and Technical College (£5,436).—C. Ramsay & Son.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Ailesworth (Northants).—Private housing estate; C. W. Shelton, Ltd., South Street, Stanground, Peterborough.

Ashbourne.—Science block for Queen Elizabeth's Grammar School; F. Hamer Crossley, architect, St. Mary's Gate, Derby.

Ayr.—Technical college, Dam Park (£500,000); county architect, County Offices, Ayr.

Billingham-on-Tees.—Houses (340), on Low Grange housing site for the U.D.C.; E. Shaw, surveyor.

Birmingham.—Works, Moor Lane, Witton; L. A. G. Manufacturing Co., Ltd., 62, Hampton Street.

Blyth.—Houses (300), Bebside; W. Leech, Ltd., builders, St. James Street, Newcastle-on-Tyne.

Brighton.—Additional factory; New Welbeck, Ltd., Moulsecoomb Way.

Cardiff.—Houses (172), Upper Rookery site; city architect, 12, Park Place.

Chesterfield.—£17,500 scheme for new office accommodation; R.D.C. surveyor, Chesterfield.

Cumberland.—Highways depot at Cockermouth for the C.C. (£50,000); county architect, Portland Square, Carlisle.

Dagenham.—Methodist church, Manor Road; Robert Atkinson & Partners, architects, 13, Manchester Square, W.1.

Darlington.—R.C. church at Cockerton; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

Houses (150), west of the Cree Beck, and further houses on the Branksome estate; E. A. Tornbohm, borough architect.

Dewsbury.—Secondary technical school; Abbey & Hanson, architects, 11, Cloth Hall Street, Huddersfield.

Doncaster.—New single-storey block with two wards and dayrooms at St. Catherine's Institution; Sheffield Regional Hospital Board.

Dunstable.—Factory and offices, London Road and Mayfield Road; Hawthorn Baker, Ltd., Nicholas Lane.

Edgware.—Maisonnettes (58), Purcells Avenue; Sterling Homes, Ltd., 32, Shaftesbury Avenue, W.1.

Edlington.—New comprehensive school for West Riding County Council; county architect, Wakefield, Yorks.

Edmonton.—Two-storey factory block on Claverings industrial estate; borough architect, Town Hall, N.9.

Evesham.—Bungalows (23), Fairfield estate; Pemberton & Bateman, architects, 21, Vine Street, Evesham.

Guildford.—Dwellings (92) for aged persons, Merrow House estate; Geo. Lowe & Partners, architects, 4, High Street, Croydon.

Harwich.—Maternity unit, District Hospital (£40,000); Huttons, Ltd., builders, Birch, Colchester.

Hemel Hempstead.—Laboratories and offices; British Standards Institution, 2, Park Street, W.1.

High Wycombe.—Works extensions for Stephens & Carter, Ltd., Coronation Road; J. M. Jones & Sons, Ltd., builders, Highway Works, Maidenhead.

Hitchin.—Erection of new Council offices in Grammar School Walk; R. Walker, surveyor, 21, Bancroft, Hitchin, Herts.

Holbeach.—Home for old people, rear of Stukeley Hall; county architect, Boston, Lincs.

Littlehampton.—Housing estate off Parkside Avenue; Ortem Estates, Ltd., Kensal House, Harrow Road, W.10.

London.—Two three-storey blocks and one six-storey block of dwellings, Stepney; Sydney Clough, Son & Partners, architects, 39, Devonshire Street, W.1.

Multi-storey office block, Coleman Street, E.C.; David du R. Aberdeen, architect, 19, Southampton Place, W.C.1.

Luton.—Shops and offices, Dunstable Road; Sterling Estates, Ltd., 77, Grosvenor Street, W.1.

Macclesfield.—Houses (119), Weston; borough architect, 3, Jordangate.

Mansfield.—Works extensions for Remploy, Ltd., Sutton Road; Crooks & Butler, Ltd., builders, Victoria Street.

Narborough.—Extensions to Council offices (£55,000); engineer and surveyor, Blaby R.D.C., Narborough, Leics.

Newcastle (Staffs).—Two-storey block of shops and offices, Hassell Street (£55,454); borough surveyor, Lancaster Buildings, High Street.

Newport Pagnell.—Plans of further 52 bungalows approved; U.D.C. surveyor.

Northampton.—Flats (60), Horsemarket redevelopment area; borough architect.

Northumberland.—Maternity and child welfare centre at Forest Hall; county architect, County Hall, Newcastle-on-Tyne.

Oxford.—Third stage of College of Art, Commerce and Technology (£285,000); Lavender, McMillan & Co., Ltd., builders, Cheam Common Road, Worcester Park.

Tynemouth.—Civic centre, Preston North Road (£500,000); borough engineer.

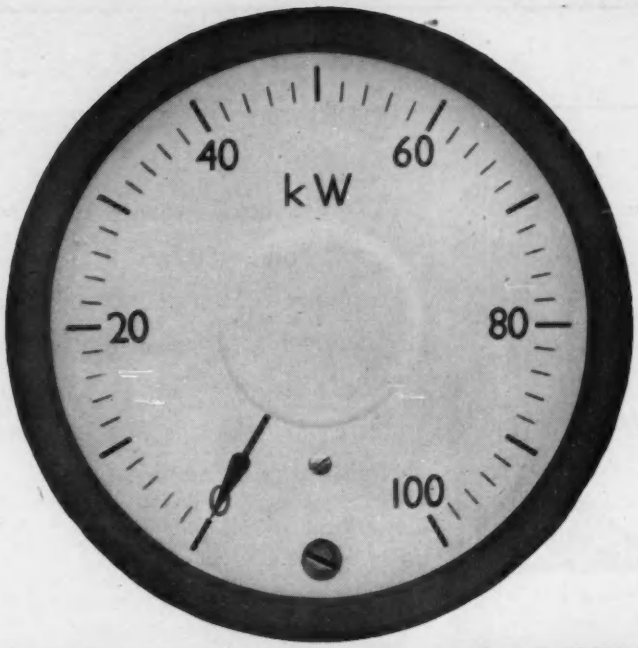
Wakefield.—Church, Handal Lane; Arthur Farebrother & Partners, architects, 99, Seymour Grove, Manchester.

Housing estate, Horbury; Fell Construction Co., Ltd., 20/30, Lawefield Lane.

West Bromwich.—Houses (173); W. H. Greenwood, borough engineer, Town Hall.

Factory and offices, Brandon Way; Ready Bros., Ltd.; Izans Road dwellings (89), Lamberts End; borough engineer.

Worcester.—Houses (281), Warndon estate, and houses (18), Newtown and Tolladine estates; city engineer, 22, Bridge Street.



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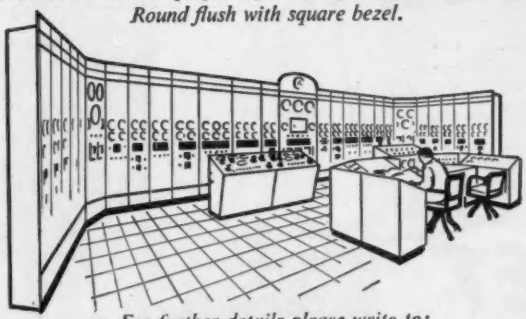
PATTERNS: *Round projecting. Round flush (as illustrated). Round flush with square bezel.*



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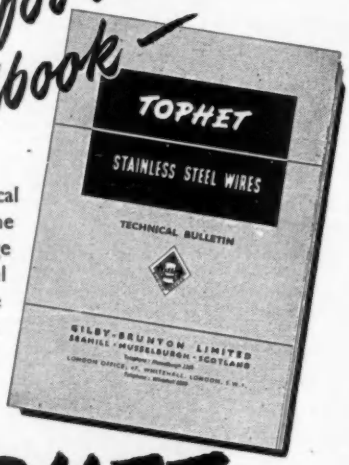

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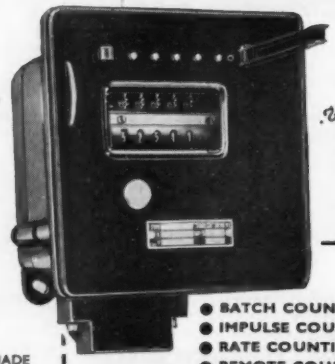
Automation

starts with counting



Batch Counting Unit with Automatic Reset

- BATCH COUNTING
- IMPULSE COUNTING
- RATE COUNTING
- REMOTE COUNTING

SWISS PRECISION MADE
Manufactured by Société des Compteurs de Genève, Geneva, Switzerland

The SODECO range of impulse counters and impulsing units provide the basic components for automation of counting, batching, positioning and other manufacturing processes. *Let us advise you on your problems.*

STONEBRIDGE CONTROLS & INSTRUMENTS

THE STONEBRIDGE ELECTRICAL CO. LTD.
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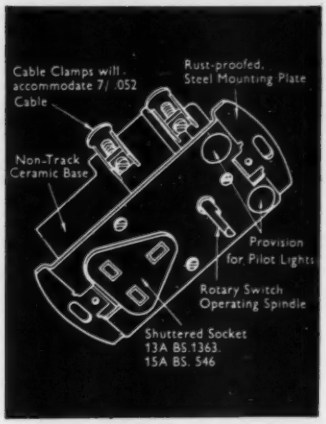
Telephone: TRAfalgar 1444

Simplex leadership in domestic electric appliances is further exemplified by this Cooker Control Unit. It's a fine, clean, smoothly contoured job to B.S.1833 dimensions and attractively finished in cream or white as standard or any of the Creda matching colours.

The single rotary control, with four clearly defined positions, operates two independent switches for either individual or combined operation of cooker and auxiliary circuits. Pilot indicating lights are available if required.

Rating: ***Cooker Switch*** **30/45 *amp.***
Auxiliary Circuits **13 *or* 15 *amp.***


Cable Clamps will accommodate 7/.052 Cable
Rust-proofed Steel Mounting Plate
Non-Track Ceramic Base
Provision for Pilot Lights
Rotary Switch Operating Spindle
Shuttered Socket 13A BS.1363. 15A BS. 546

NEW — FROM SIMPLEX

AN ULTRA-SMART

COOKER CONTROL UNIT

AT OUTSTANDING AND

INCOMPARABLE VALUE

22/4^{D} 13A
(WITHOUT PLUG)
25/4^{D} 15A
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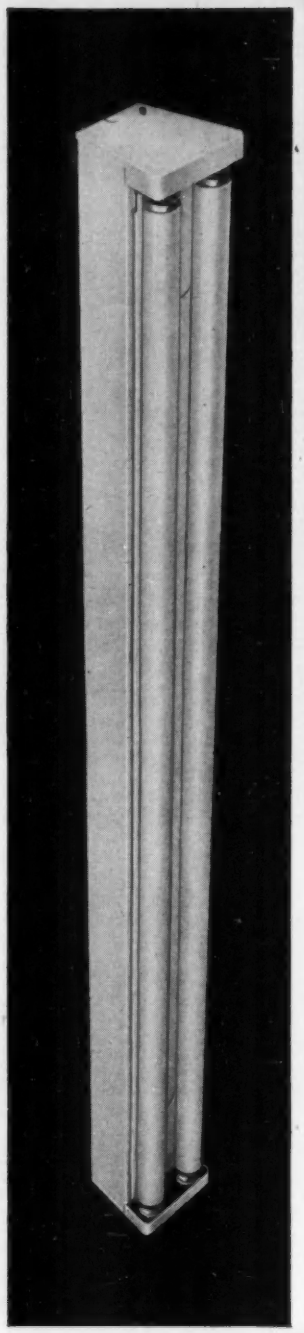


FALKS Introduce

the new adaptable "SUMMIT" Range

(SERIES I INDUSTRIAL FITTINGS)

In introducing the "Summit" range of fluorescent lighting fittings, Falks have made *adaptability* the keynote of their design. Adaptability is achieved by using one basic channel, with provision for altering not only the appearance but also the lamping, the control gear and the suspension of the fitting. The ideal lighting fitting indeed!

SPECIFICATION

Basic Channel Special Section 20 s.w.g. *zinc-coated steel*; provides for cover plate and reflector fixings and embodies internal and external wiring channels.

Cover Plate Secured by *quick release fasteners*; Provision for easy access to starter switches without removing cover plate.

End Plates Die-cast aluminium alloy secured by threaded studs.

Lampholder Brackets Two sizes, single and twin lamp; triple lamp.

GENERAL FEATURES

Lamping Generally, all models are available for 5 ft., 4 ft. and 2 ft. lamp lengths in single, twin and triple lamp arrangements.

Control Gear Starter or quickstart.

Material & Finish *Zinc-coated sheet steel throughout; etch primed and finished stove enamelled egg shell off-white.* (Reflectors glossy white).

Suspension— Variable centres, for ½", ⅝" or ¾" diam. conduit. Keyhole slots are provided for direct ceiling fixing.

Interchangeability By using all the combinations of number and size of lamps together with type of fitting, over 70 different assemblies can be achieved in this series, each with starter or quickstart control gear.

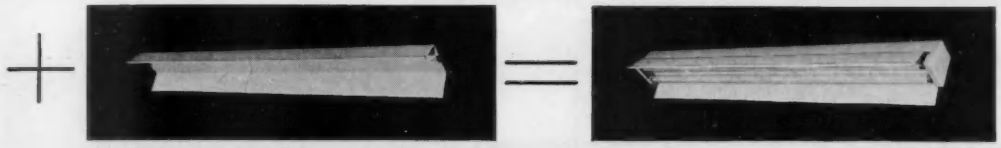
Erection Whether by direct fixing or chain or rod suspension, erection is effected in the simplest way possible.

FALKS SUMMIT RANGE

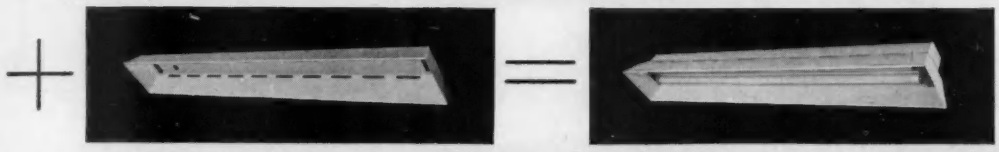
was shown at the

1958 Electrical Engineers (A.S.E.E.) Exhibition

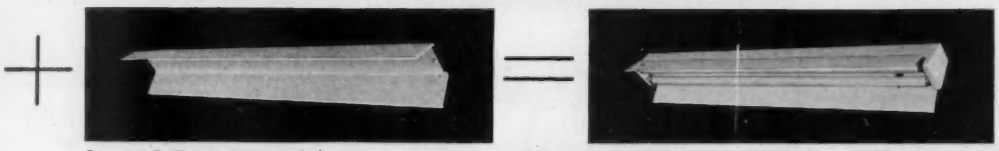
at Earls Court



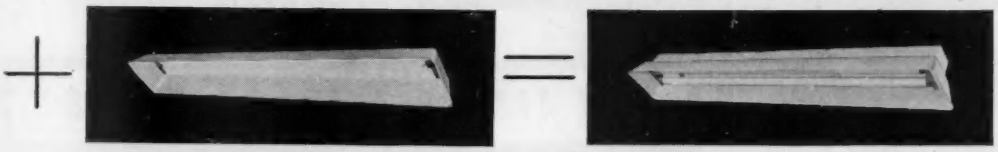
Metal Reflector, open ended — CHILTERN



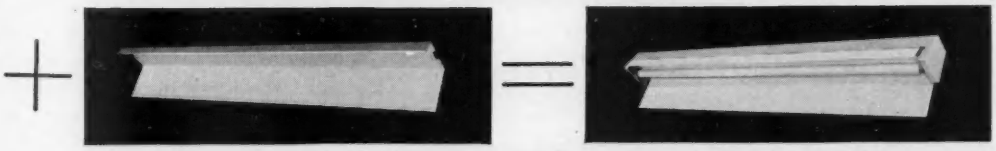
Metal Reflector, closed ended — COTSWOLD



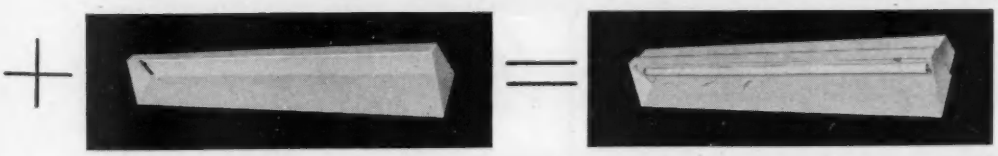
Perspex Reflector, open ended — CHEVIOT



Perspex Reflector, closed ended — MENDIP



BLACKBOARD I
(Open-ended)



BLACKBOARD II
(Closed-ended)

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Designed by R. F. Steward, L.S.I.A. of Falks.

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Leaflet P.2723

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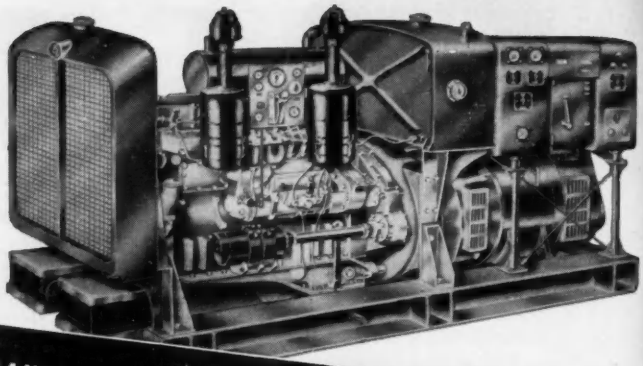
MEADOWS

now introduce



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Common set and engine components allow a wide degree of interchangeability throughout range.

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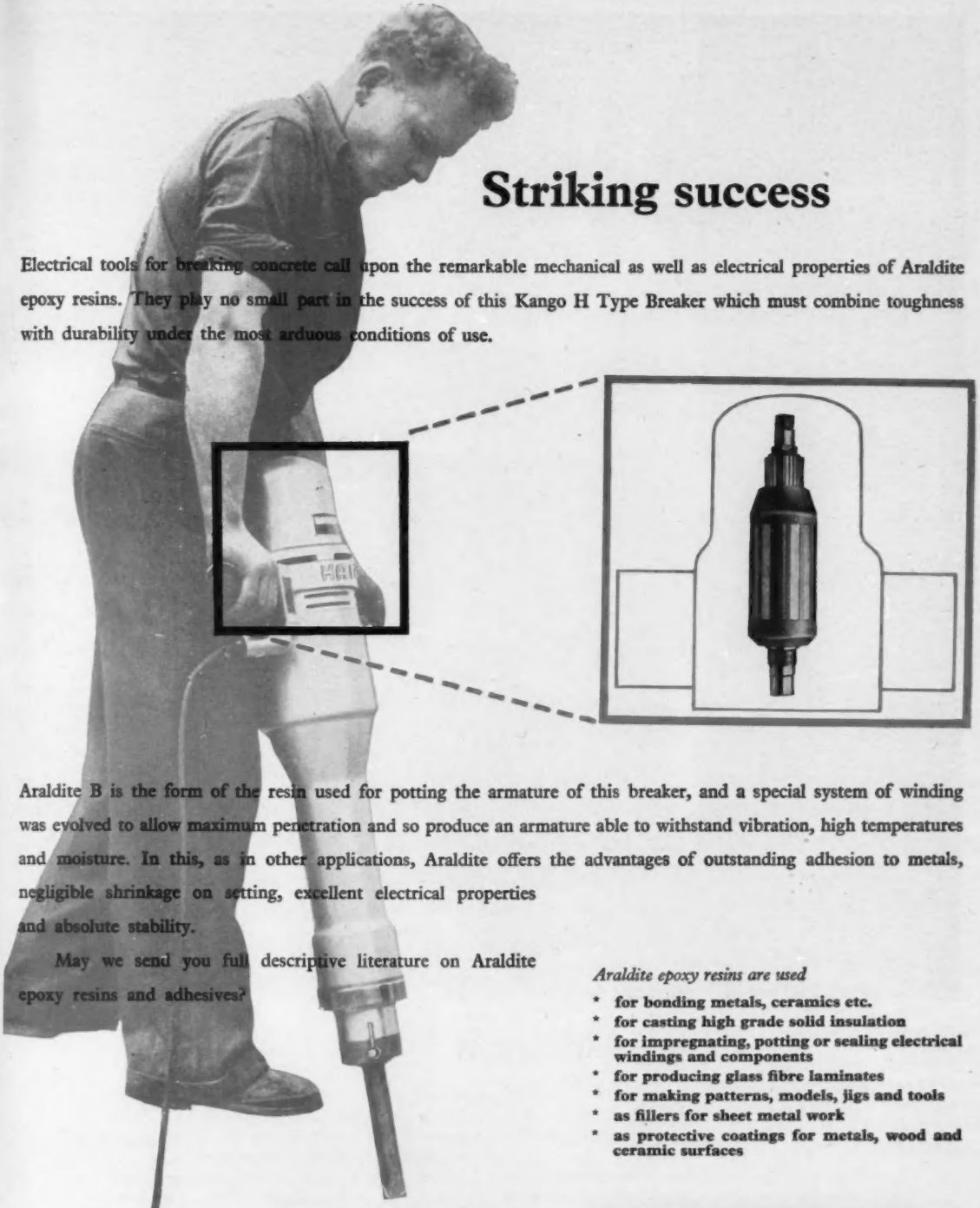
MID 74

Striking success

Electrical tools for breaking concrete call upon the remarkable mechanical as well as electrical properties of Araldite epoxy resins. They play no small part in the success of this Kango H Type Breaker which must combine toughness with durability under the most arduous conditions of use.



Araldite B is the form of the resin used for potting the armature of this breaker, and a special system of winding was evolved to allow maximum penetration and so produce an armature able to withstand vibration, high temperatures and moisture. In this, as in other applications, Araldite offers the advantages of outstanding adhesion to metals, negligible shrinkage on setting, excellent electrical properties and absolute stability.

May we send you full descriptive literature on Araldite epoxy resins and adhesives?

Araldite epoxy resins are used

- **for bonding metals, ceramics etc.**
- **for casting high grade solid insulation**
- **for impregnating, potting or sealing electrical windings and components**
- **for producing glass fibre laminates**
- **for making patterns, models, jigs and tools**
- **as fillers for sheet metal work**
- **as protective coatings for metals, wood and ceramic surfaces**

Araldite *epoxy resins*

Araldite is a registered trade name

CIBA (A.R.L.) LIMITED Duxford, Cambridge. Telephone: Sawston 2121

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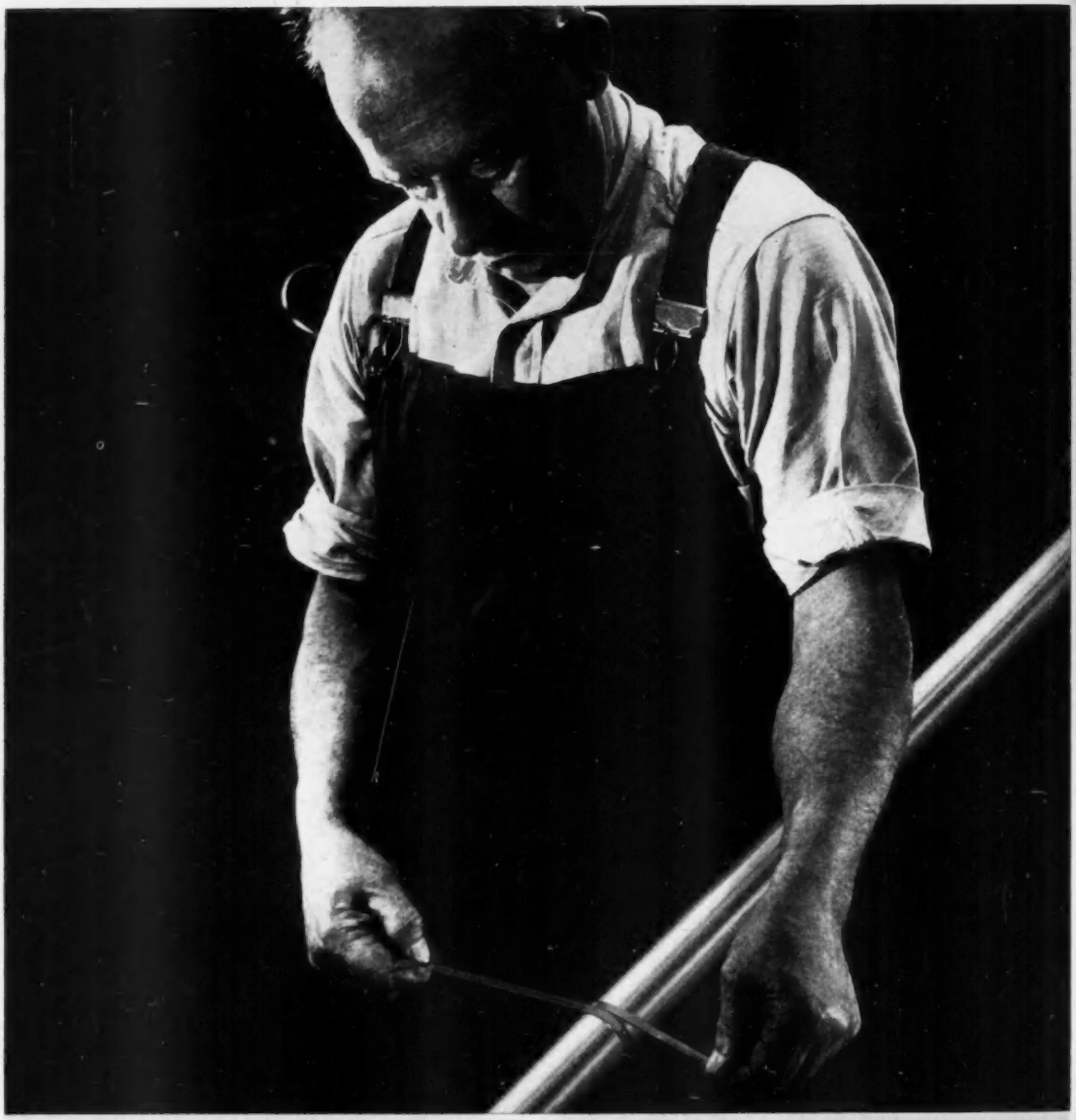

Moment of Truth

What is remarkable about this picture is its unremarkability. A routine check on the diameter of a lead-sheathed cable at the start of a new run.

In its very matter-of-factness this operation reflects the thoroughness of J. & P.'s approach to the job in hand.

J. & P. make no automatic assumptions. Check and double check are applied at every stage of the manufacture of cables, transformers, switchgear & capacitors.

Working to these uncompromising standards, J. & P. determine to satisfy their customers by first satisfying themselves.

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A POWER IN THE ELECTRICAL WORLD

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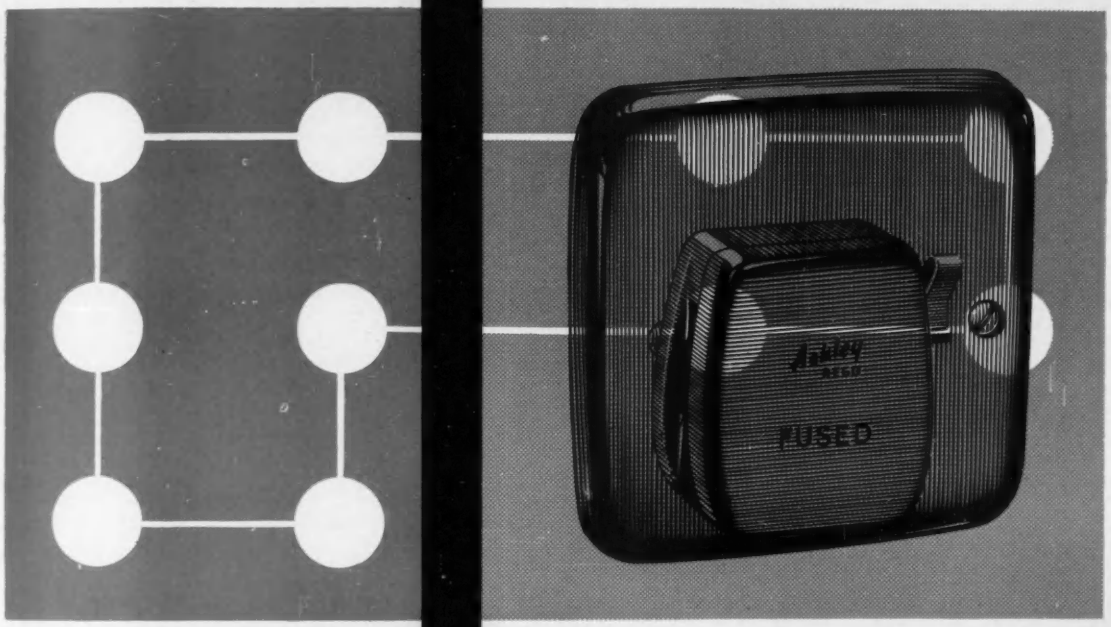
connect with **Ashley** *for quality*



B.S.1363 & 2814. All-insulated. Brown or Cream, Smooth contour styling. Robust high quality mouldings. Flush. For plaster depth or deep socket-boxes. Surface. With pattress, Six knockouts in sides. Safety shuttered. Large terminals, easily wired. Slow break switch, silver contacts, nylon pad, Quiet and positive action. Robust plug, block terminals. B.S. 1362 cartridge fuse-link. High Impact type also available.

BACKPLATES

I.E.E. Ref. 207G. Backplates supplied with the surface units as standard. If not required, surface unit prices are reduced by 1/- doz. list.

FUSED PLUGS

Are not included in the price table shown. Cat. Nos. PG 13 Brown 34/- doz. list, PG 14 Cream 38/- doz. list. PG 15 Black, High Impact 49/- doz. list. Each includes 13 amp Fuselink as standard,-10,5, or 2 amp, if specified.

CARTRIDGE FUSE LINKS

B.S. 1362. 13 amp Brown, 10 amp Yellow, 5 amp Grey, 2 amp Blue. All 7/- doz. list.

13 AMP RING CIRCUIT

SOCKET AND SWITCHSOCKET

OUTLETS, FUSED PLUGS

SOCKET OUTLETS			SWITCHSOCKET OUTLETS		
CAT NO.	DOZ. LIST	TYPE	CAT NO.	DOZ. LIST	TYPE
SK 31	44/-	Surface Br.	SS 31	69/-	Surface Br.
SK 32	50/-	Surface Cr.	SS 32	76/-	Surface Cr.
SK 35	42/-	Flush Br.	SS 35	67/-	Flush Br.
SK 36	48/-	Flush Cr.	SS 36	74/-	Flush Cr.

Br. = Brown Cr. = Cream

Ashley REGD. **the live-wire service**

ASHLEY ACCESSORIES LTD ULVERSTON LANCASHIRE

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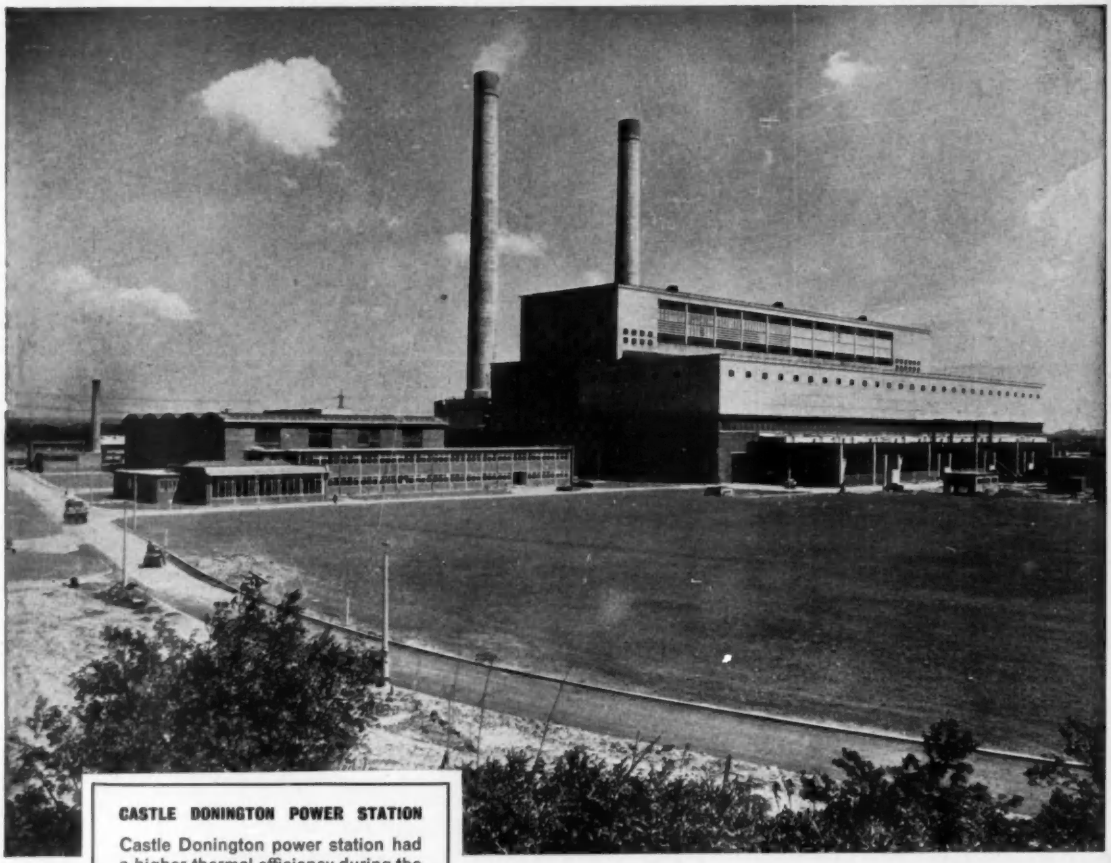
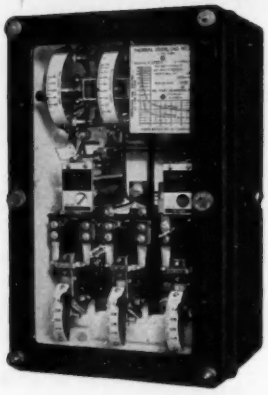


CASTLE DONINGTON POWER STATION

Castle Donington power station had a higher thermal efficiency during the year ended 31st Mar., 1957, than any other power station in Great Britain. The motors driving the auxiliaries are protected by P & B Golds relays in this and many other power stations of the Central Electricity Generating Board.

C·E·G·B chose P&B Golds protection



P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.
P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.
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PROTECTION RELAYS

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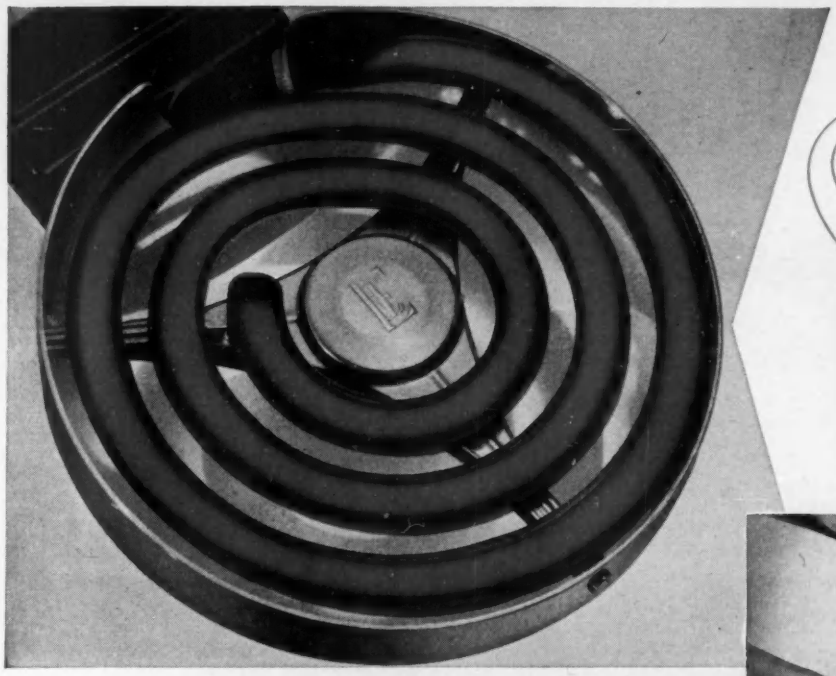
NEW 'ENGLISH ELECTRIC'



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Radiant Hotplates

available in 6¼" and 8" diameters

New hinged coil means easier, more convenient cleaning. Made specially to cope with spilled liquids. Coil swivels up for easier cleaning of new, deeper reflector plate.

Maximum contact area ensures fast boiling. Wide flat-topped coil provides a bigger contact area. Ensures quicker, lower-cost cooking.

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The ENGLISH ELECTRIC Vee-line Radiant Hotplate is designed to conform fully to the EDA Interchangeability Specification for all makes of cookers.

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TRANSFORMERS OF ALL TYPES

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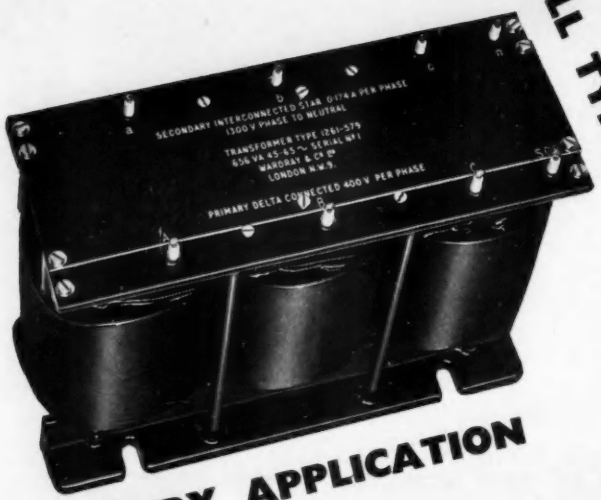
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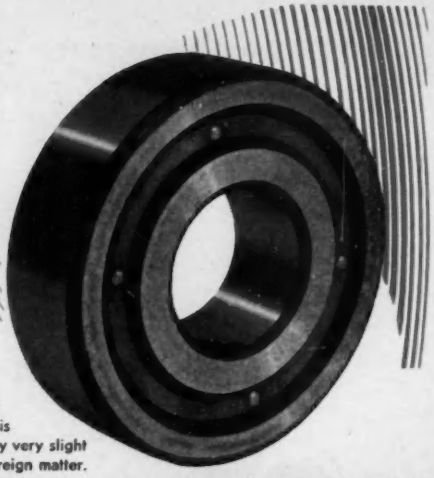

years of it, is the startling record of this Hoffmann Ball Bearing on a Royce crane. And after this marathon run, wear is imperceptible on the moving parts and only very slight damage to tracks due to the ingress of foreign matter.

If you have a Hoffmann Bearing which has been in service for a similar period or longer, we should be most interested to have details. The bearing would naturally be Hoffmann, as we were then the only British manufacturers of the radial ball bearing.

HOFFMANN **BALL & ROLLER BEARINGS**

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Visible indication on contact with a live conductor, or in case of high voltages as soon as Detector approaches and before contact is made.

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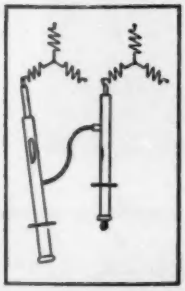

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To locate interconnections between two A.C. systems.

'PARTRIDGE' PRESSURE DETECTORS
Give visible and audible indication of whether lines and contacts of draw-out switchgear are alive or dead.

NO EARTH CONNECTION REQUIRED

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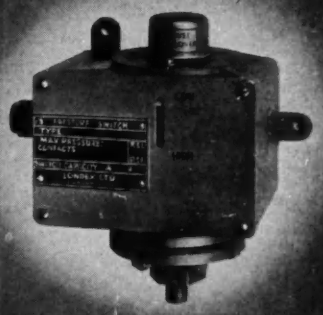
LONDEX *Pressure Switches*

FOR ALARM CIRCUITS



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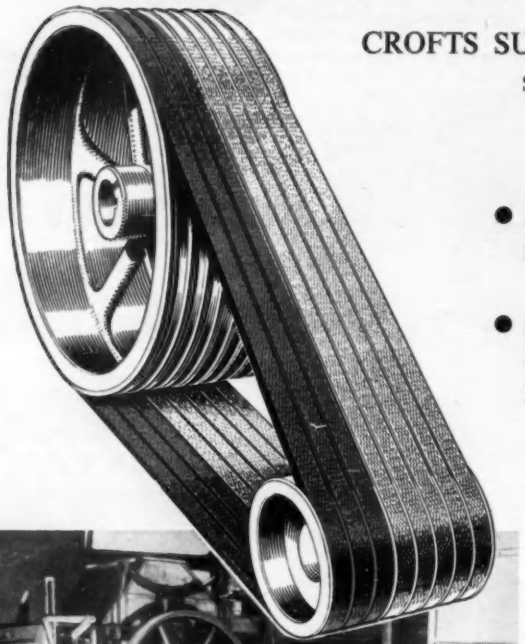
CROFTS MAKE



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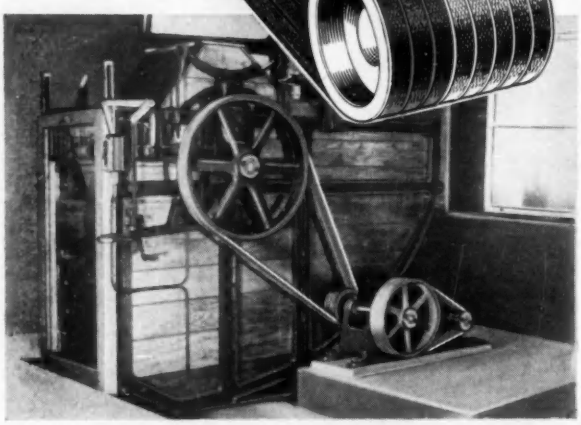
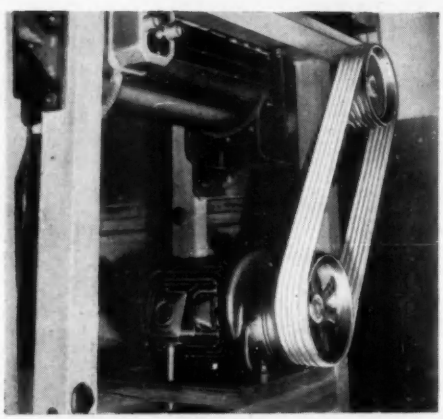
Standard drives up to 950 h.p. Ratios up to 8 : 1.

Publication 156

- premium grade ropes give 25 to 75% more power, yet retain long-life durability
- pulleys supplied with either parallel-bored and keywayed or fitted with quick-change Crofts Patent Taper-Flushbush

drives up to 150 hp from stock





These applications are typical examples of the adaptability of Taper-Flushbush V-rope Pulley drives

CROFTS (ENGINEERS) LIMITED

POWER TRANSMISSION ENGINEERS

Head Office: Thornbury Bradford 3 Yorkshire

Telephone: 63251 (20 lines) Telegrams: "Crofters Bradford Telex" Telex 51186

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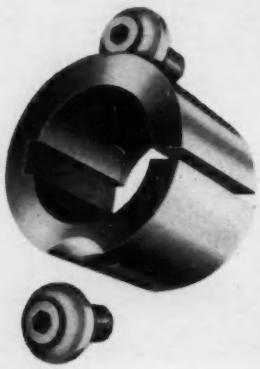
CROFTS PATENT TAPER-FLUSHBUSH

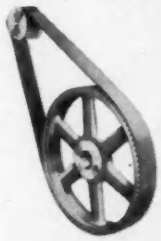
⅜" to 4½" bore from stock

Publication DM15



- Easy to fit or remove
- interchangeable bushes to fit a wide range of shafts
- many sizes of Crofts pulleys, chain sprockets and flexible couplings are fitted with the Patent-Flushbush.

You can buy the bush to fit to your products or we can supply it in a hub ready to weld on to your conveyor drives etc.



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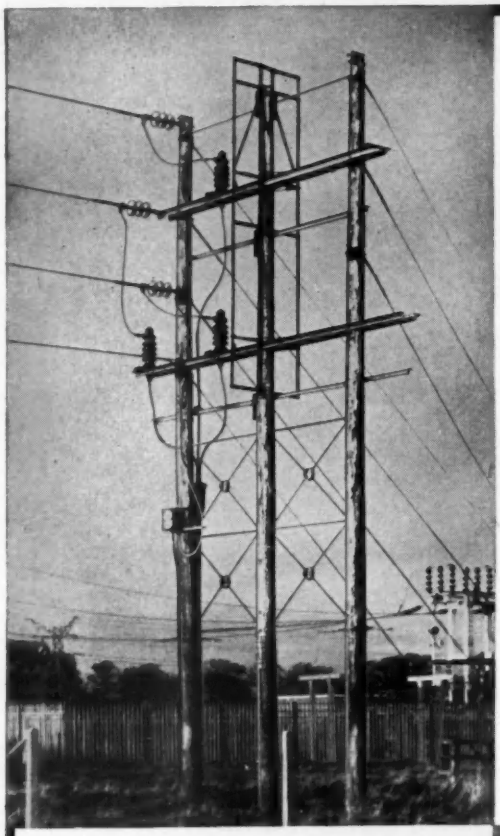

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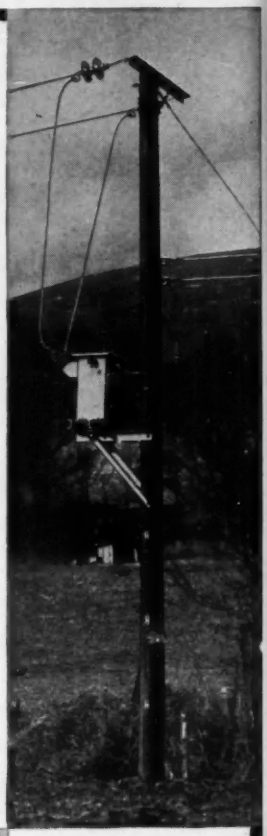

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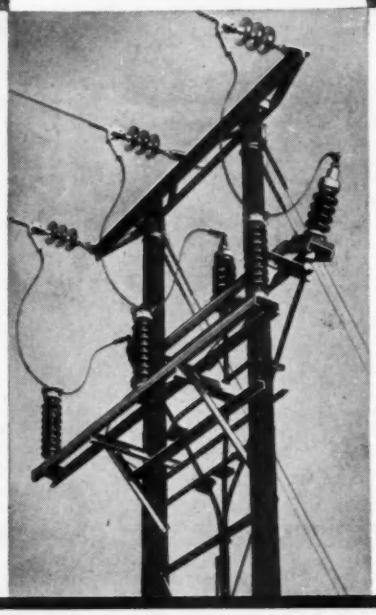

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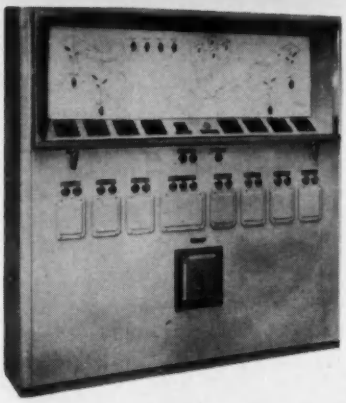

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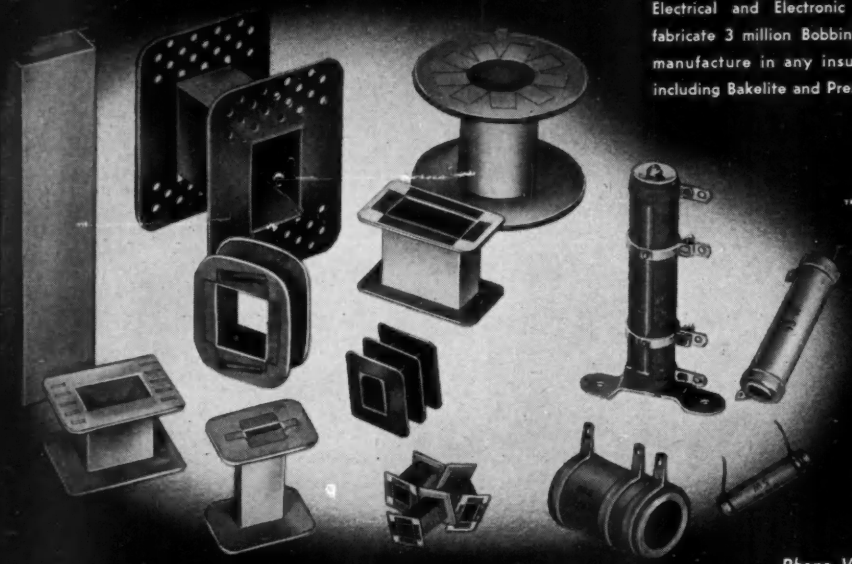

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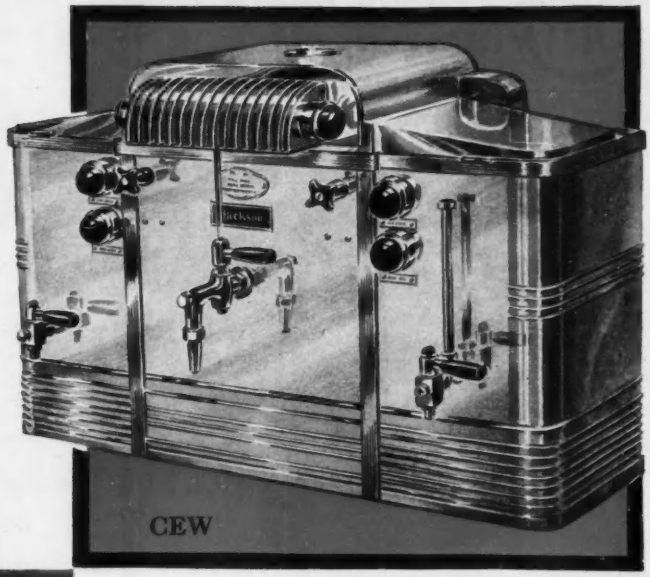

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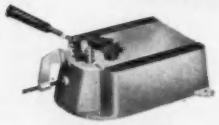

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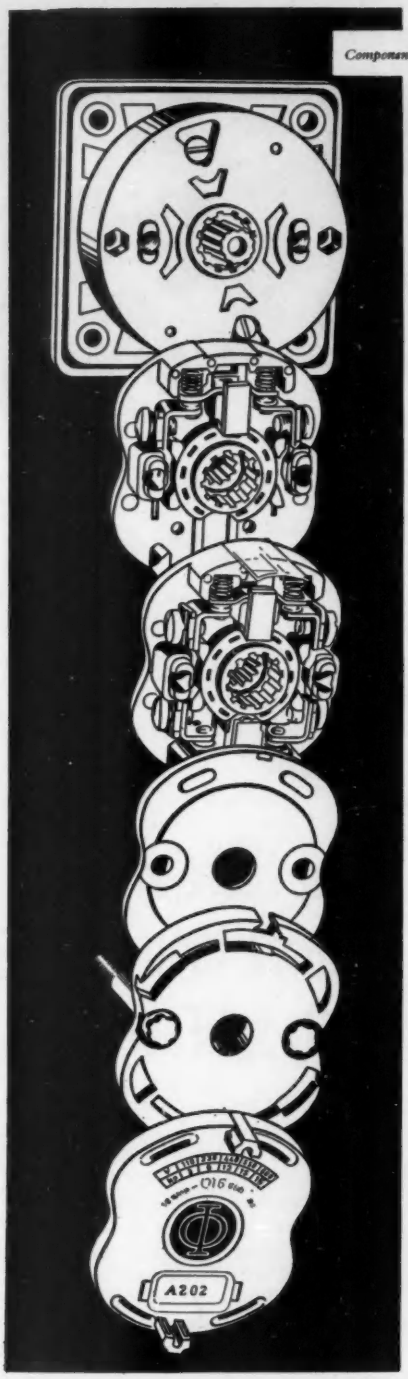

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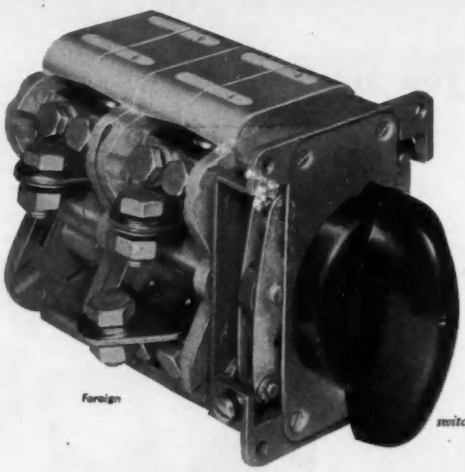

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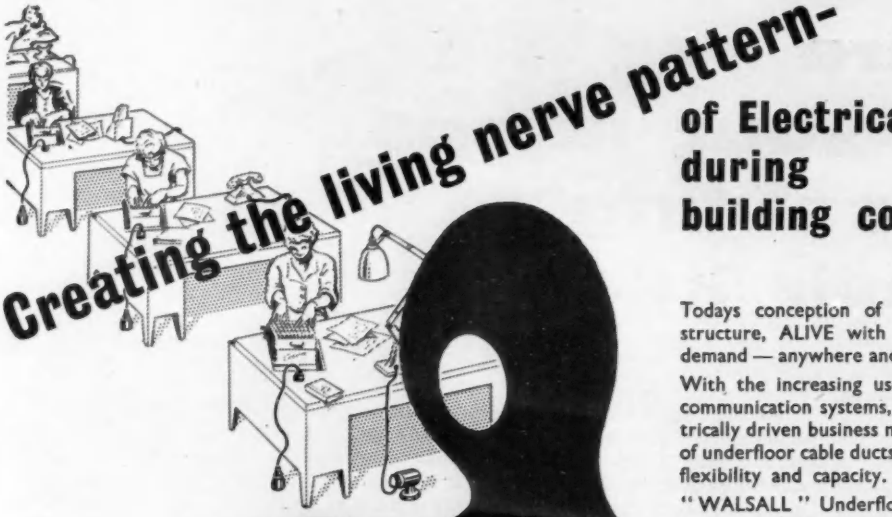

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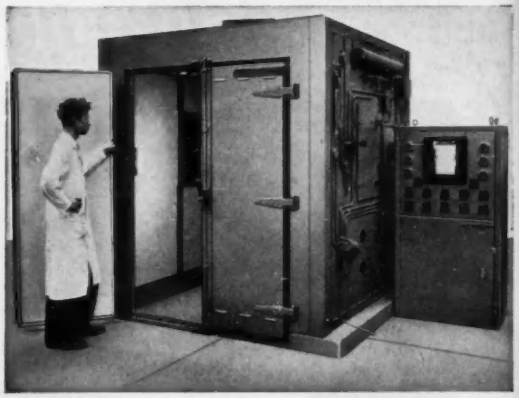

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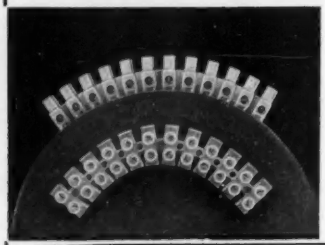

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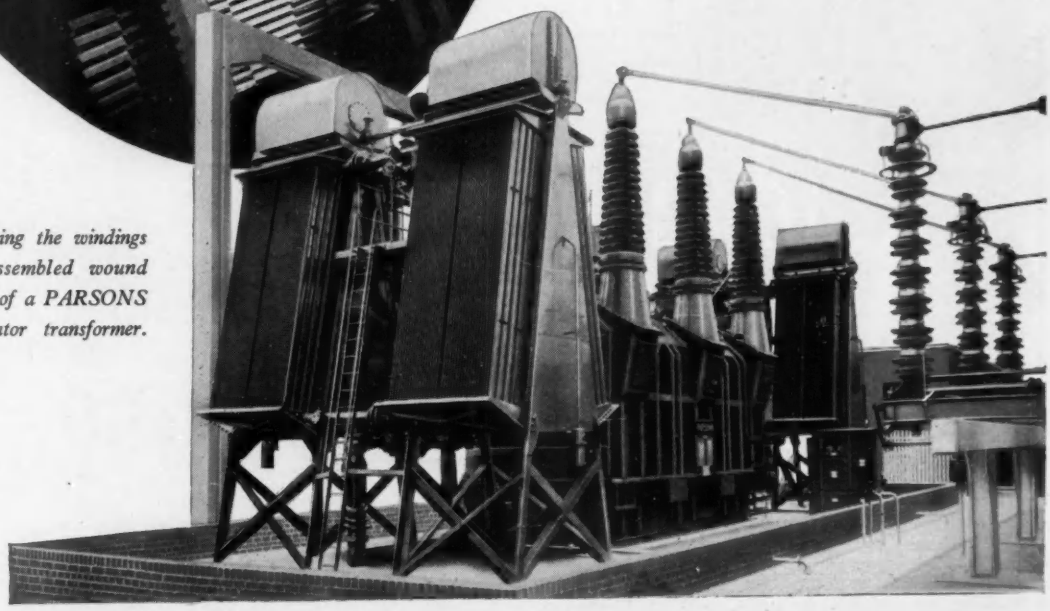

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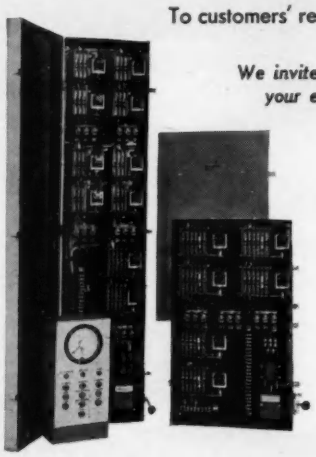

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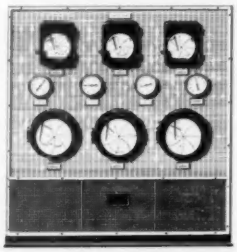

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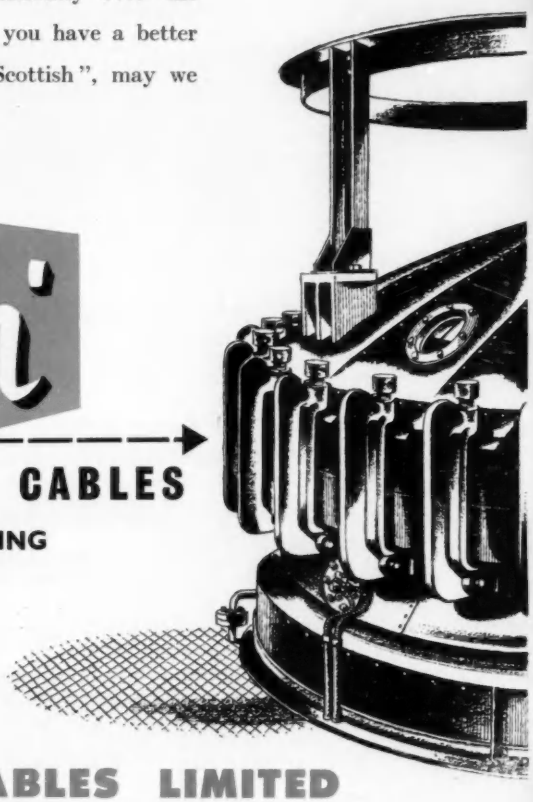

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Commutator motors, discharge lighting, thermostat operation and electro-medical equipment are the prime offenders. The best way to tackle the job of suppression is to build-in the necessary components at the equipment manufacturing stage. Wisely, most manufacturers rely on Plessey Suppressors, of which there are four main types giving a comprehensive coverage for the majority of requirements. Additionally our accumulated experience of design and production of composite filters is freely available as a technical service to the electrical industry.
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4 Suppressor ranges by Plessey

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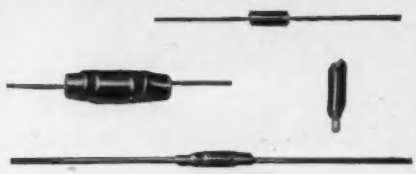
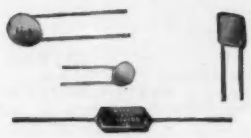
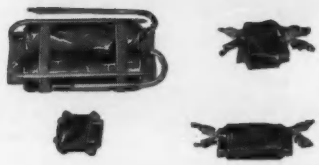


Capacitors for Radio and Television Interference Suppression



Radio Interference Suppression Inductors



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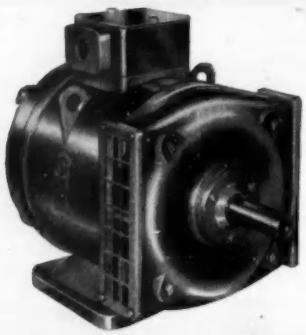

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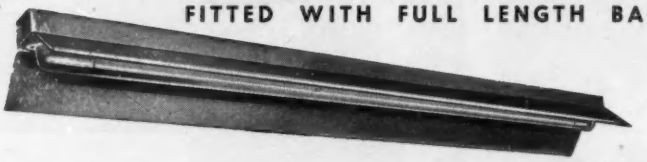

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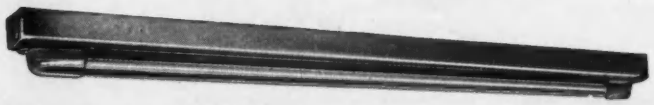

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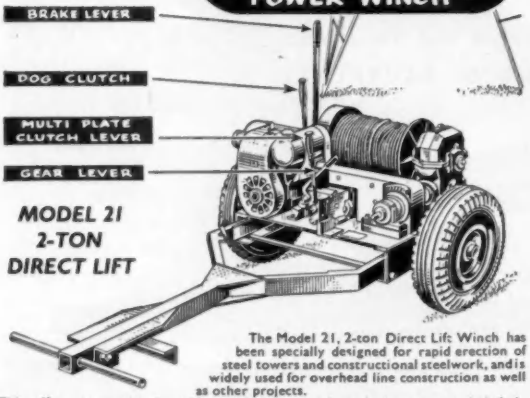

MODEL 21 2-TON DIRECT LIFT

The Model 21, 2-ton Direct Lift Winch has been specially designed for rapid erection of steel towers and constructional steelwork, and is widely used for overhead line construction as well as other projects.

This self-sustaining Winch enables steel sections to be inched on to exact bolt-hole locations by its ability to lower a load under power by means of a 3-speed and reverse gearbox and clutch, thus affecting complete and accurate control of the load at all times. By use of this Winch construction costs can be considerably reduced. This portable, pneumatic tyred Winch is fitted with sprags fore and aft for anchoring to the ground, and can be supplied with either a petrol or diesel engine. Please write for full details.

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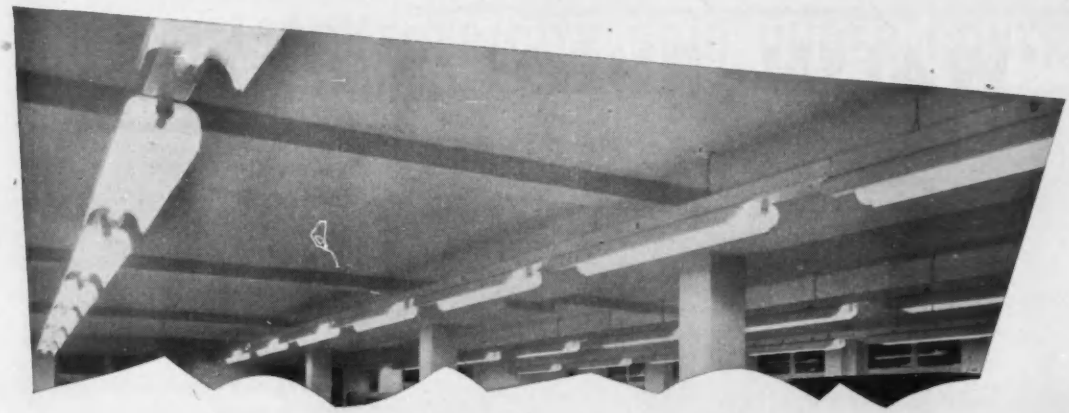
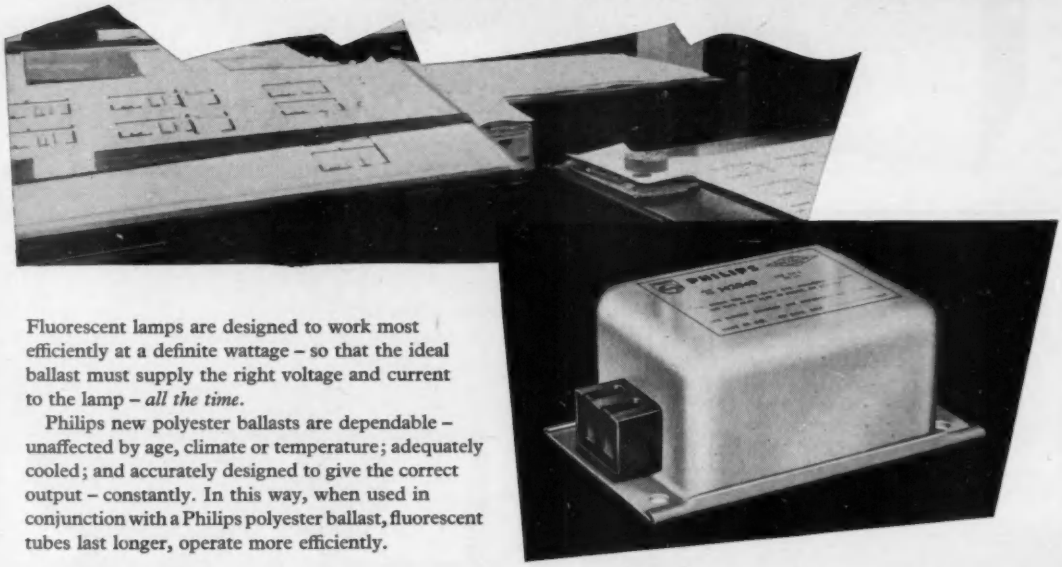


The right wattage in the lamp with **PHILIPS** polyester ballasts



Fluorescent lamps are designed to work most efficiently at a definite wattage – so that the ideal ballast must supply the right voltage and current to the lamp – *all the time.*

Philips new polyester ballasts are dependable – unaffected by age, climate or temperature; adequately cooled; and accurately designed to give the correct output – constantly. In this way, when used in conjunction with a Philips polyester ballast, fluorescent tubes last longer, operate more efficiently.

Compare these advantages:—

Indestructible – Solidly packed with heat-setting filling material.

Longer lived – Because the filling does not soften with heat – *and cannot leak.* Unit is hermetically sealed against humidity.

Lighter and smaller – Improved, more compact design is possible with this new filler.

Cooler – Polyester filling is close packed in close contact to casing for better heat dissipation from windings. The special formula increases thermal conductivity by a factor of *3 to 5.*

Noiseless – Polyester filling deadens all ballast noise.

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Philips polyester ballasts are filled with a new, specially prepared heat-setting filling material. This material, the product of years of research, comes close to the theoretical ideal for a filler material, so that these ballasts are – for all practical purposes–perfect.

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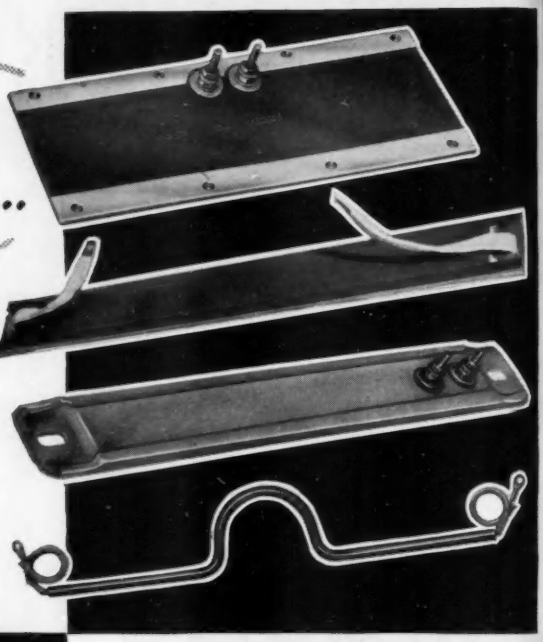

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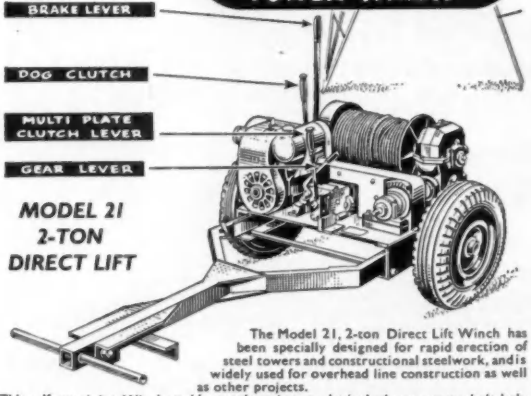

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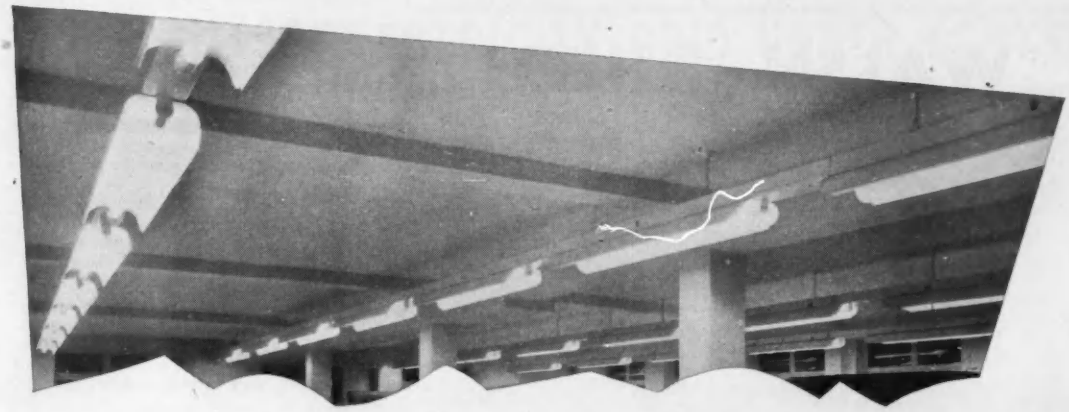

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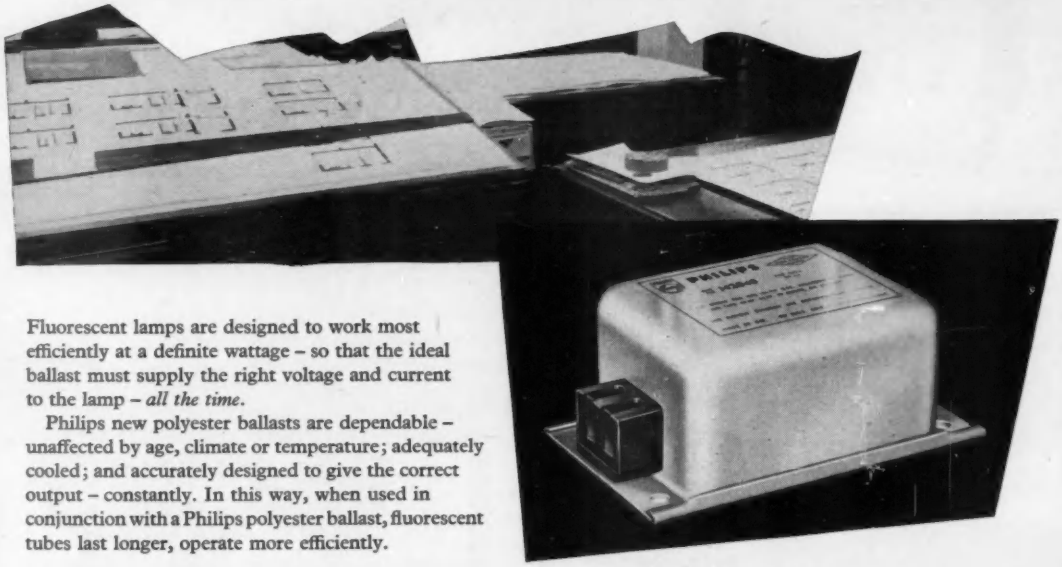

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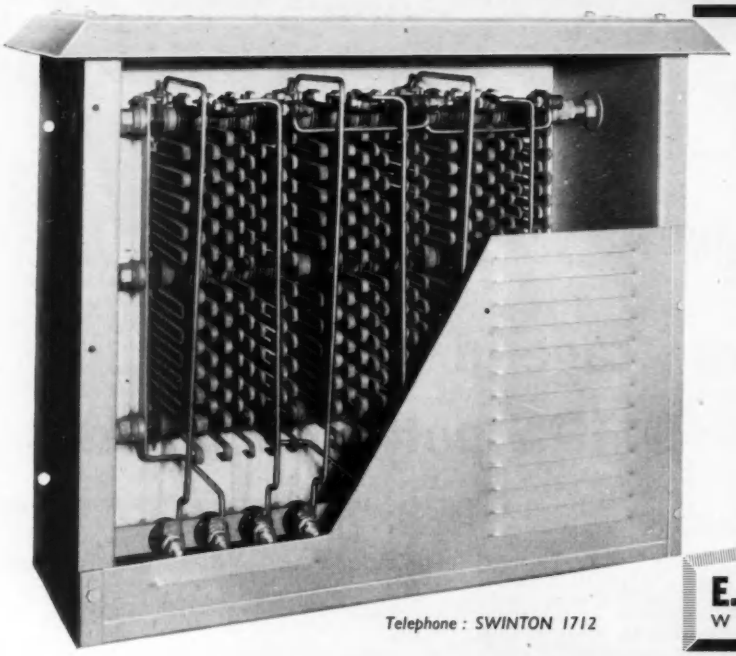

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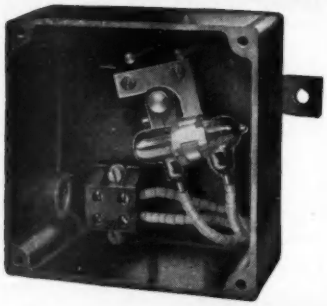

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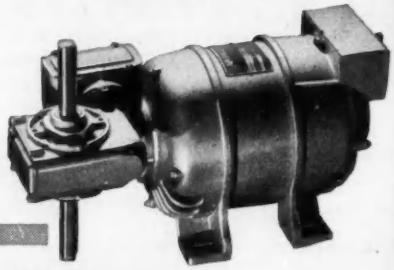

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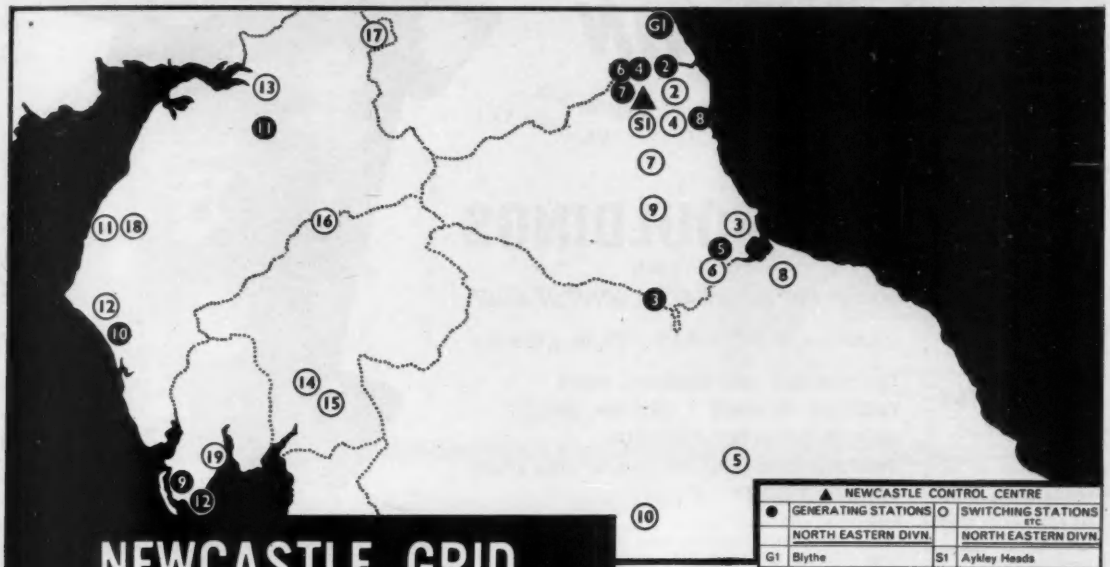

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G9	Barrow	S11	Distington
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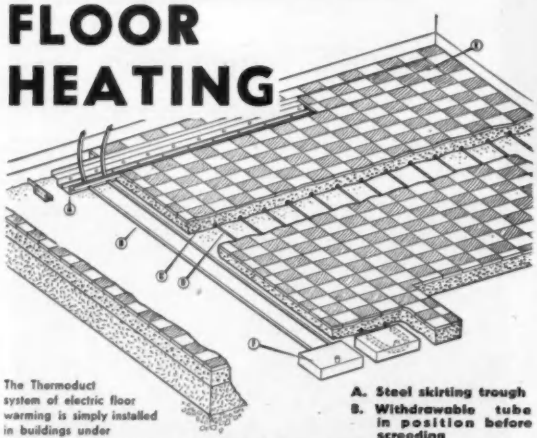

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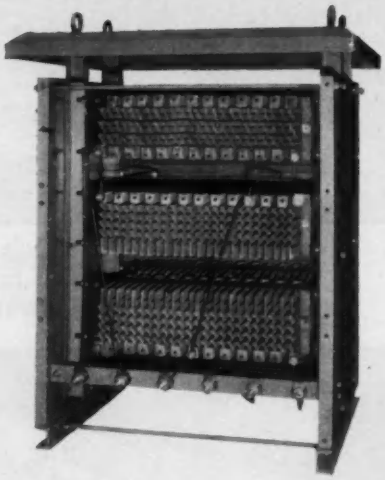

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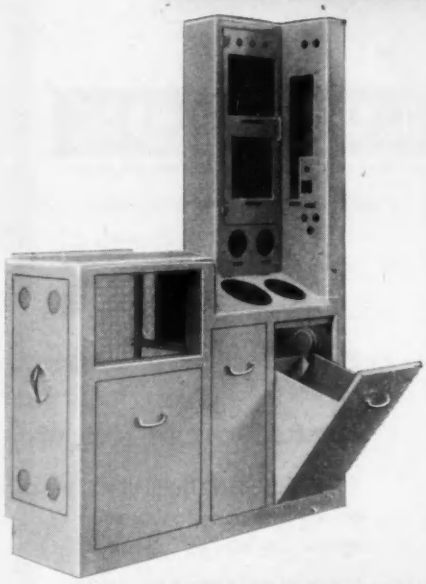

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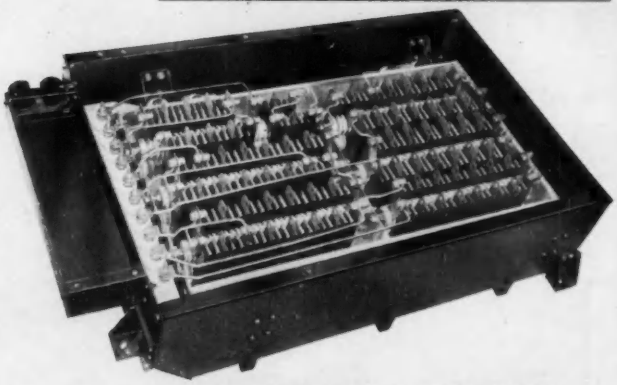

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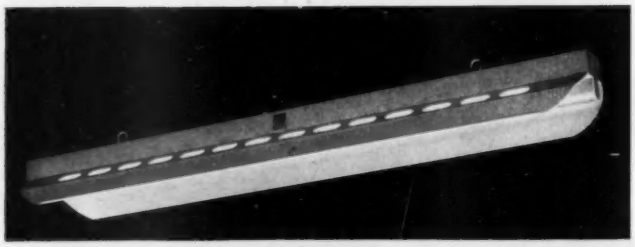

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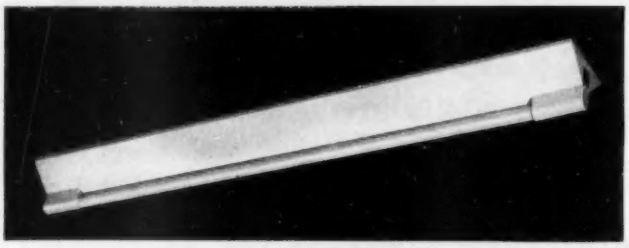


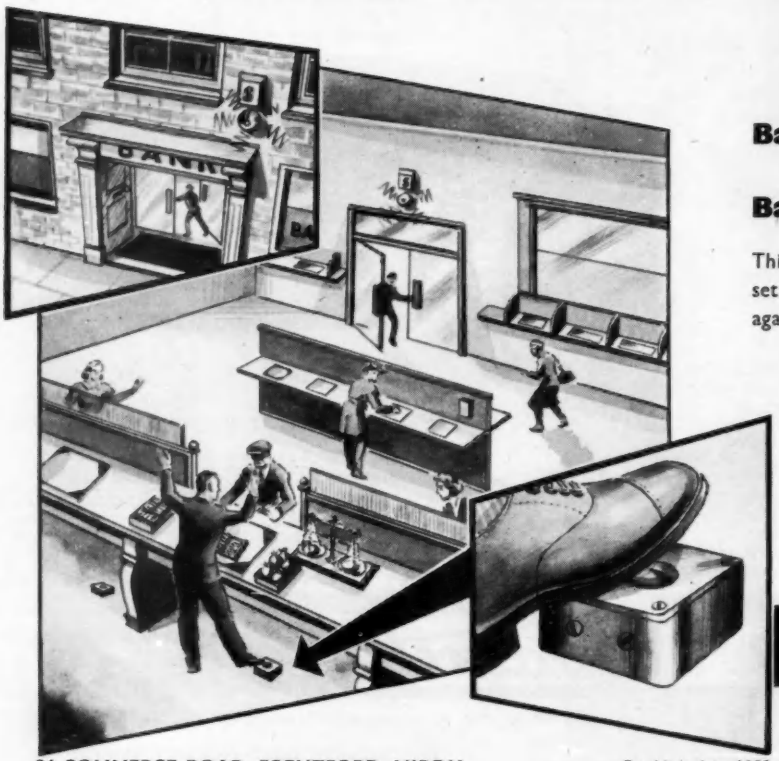
Single and Twin Lamp Lighting Units for use with 2 ft. 40 watt, 3 ft. 30 watt, 4 ft. 40 watt and 5 ft. 80 watt Fluorescent Lamps. Direct Ceiling Mounting, Built-in "Transtar" Instant Start Control Gear, Rubber Mains Connector, Earth Pin. Finished two coats White Stoved Enamel. Can be supplied with Dust Cover incorporating Spine for Chain or Conduit Suspension as an extra.

Write for Illustrated Brochure

THE NAME FOR EFFICIENT LIGHTING— **FLUORLUX**

MANUFACTURING AND CONSULTING LIGHTING ENGINEERS

FLUORLUX LIMITED · Head Office: Station Rd., Kings Norton, Birmingham 30 · *Telephone and Grams: KINgs Norton 2885*



SAX

Bandit Alarm Systems For Banks, Post Offices, etc.

This reliable installation of Alarm Bells set off by Foot contact is effective against the hold-up bandit.

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Full details of SAX bells, Relays, Foot Contacts, etc. and Diagrammatic Layout to suit particular requirements, supplied on request.

JULIUS SAX & CO. LTD.

24 COMMERCE ROAD, BRENTFORD, MIDDX. *Established in 1855* Telephone: **EAL**ing 6034/5

G.F.C.9

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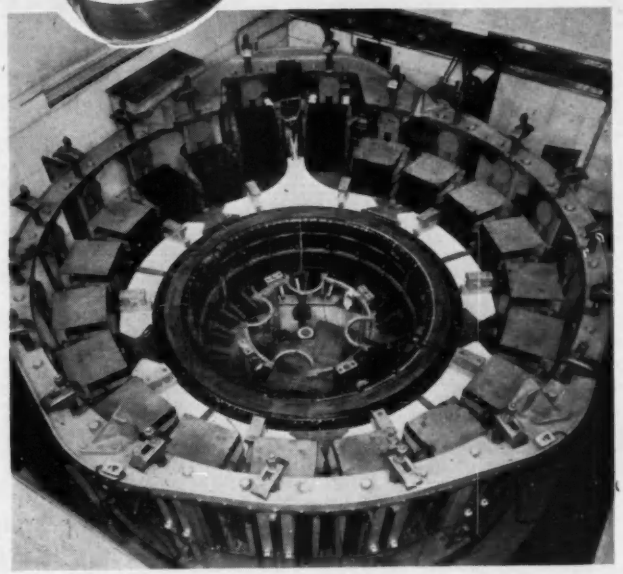
water cooled cables

The very first water-cooled cable is now installed in the Metropolitan-Vickers Synchrotron at Glasgow University. Lengths of cable have also been supplied for experimental thermonuclear purposes. This cable will carry more than twice the current of an equivalent size without water cooling. Its successful introduction is a result of the combined effort of Siemens Edison Swan Ltd. and Metropolitan-Vickers Electrical Co. Ltd.



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SIEMENS EDISON SWAN LTD. *An AEI Company*
Power Cables Division | 155 Charing Cross Road, London, W.C.2
Telephone: Gerrard 8660 Telegrams: Sieswan Westcent London

NEW Osram UNIVERSAL START

GUARANTEED TUBE

All OSRAM 5ft. 80W Guaranteed Tubes now have an unobtrusive but robust metallic stripe applied by an entirely new technique.

The OSRAM 5ft. 80W Universal Start tube (List price 13*s*. plus P.T.)—suitable for switch or switchless start circuits—means . . .

- Fewer types to stock
- Simplified ordering
- Lower installation and maintenance costs

★ ***Extra charges for metal stripe or silicone finish are now abolished on <u>all</u> OSRAM Guaranteed tubes***

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THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

SUDAN LIGHT & POWER CO. LTD.
P.O. Box No. 310, Khartoum

SUPPLY OF TRANSFORMERS

TENDERS are invited for the supply of Power Transformers for use on the company's transmission and distribution system in Khartoum :—

FOUR units are required initially, as follows:

One 10,000-kVA Transformer, voltage ratio 11,000/33,000 volts.

One 5,000-kVA Transformer, voltage ratio 33,000/11,000-6,600 volts.

Two 2,500-kVA Transformers, voltage ratio 33,000/11,000 volts.

Delivery is required in the Sudan in the last quarter of 1959.

Detailed specifications and further particulars can be obtained from The Power & Traction Finance Co. Ltd., Queens House, 28, Kingsway, London, W.C.2.

Offers should be addressed, in a sealed envelope, to the General Manager, and should be clearly marked "SLP/ED/1/58, Transformers."

The General Manager does not undertake to accept the lowest or any tender.

CLOSING DATE FOR TENDERS, 31st January, 1959.

F. S. BATTY,
General Manager. 5736

THE ELECTRICITY TRUST OF SOUTH AUSTRALIA

Port Augusta "B" Power Station

Turbo-Alternator Plant

TENDERS are invited for the manufacture, delivery, erection, testing and setting to work of the following turbo-alternator plant for Port Augusta "B" Power Station :—

Unit : No. 4 Machine.
Capacity (M.C.R.): 60 Megawatts.
Steam conditions : 900 p.s.i., 900 deg. F.

Specifications are available at the offices of the Design Engineer, Hindmarsh Buildings, Grenfell Street, Adelaide, and Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1.

The tender has to be received by 2 p.m. on Tuesday, 3rd March, 1959. No tender will necessarily be accepted. Tenders must be submitted in triplicate. Two copies to be lodged with THE CHAIRMAN, PURCHASING AND CONTRACTS COMMITTEE, ELECTRICITY TRUST OF SOUTH AUSTRALIA, KELVIN BUILDING, NORTH TERRACE, ADELAIDE, SOUTH AUSTRALIA, by the closing date and time specified, and one copy to be lodged with PREECE, CARDEW & RIDER, CONSULTING ENGINEERS, 8, 10 & 12, QUEEN ANNE'S GATE, WESTMINSTER, LONDON, S.W.1.

5772

INDIA STORE DEPARTMENT

THE Office of the Director General Supplies and Disposals, Shahjahan Road, New Delhi, India, invites tenders for the following :—

D.G.S. & D. TENDER ENQUIRY No. P/SE3/7401-J/1 for the supply of the following :—

(1) 2 Tube Co-axial Cable (qty. 212 miles).
(2) Jointing Material.
(3) Jointing Box complete.
(4) Cable Terminating Equipment.
(5) Gas Pressure Alarm Equipment.
(6) Testing Equipment for testing the cables before laying, during laying and commissioning.

Specifications, drawings, etc., relative to the above can be purchased from the Co-ordination Department, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, at 15 shillings per set. Tenders are to be returned direct to the Director General Supplies and Disposals, Shahjahan Road, New Delhi, India, so as to reach them by 2.30 p.m. on 30th December, 1958.

Specimen copy of the above specification is on view at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.4008/58/AVH/ENG.2. 5761

ILKLEY URBAN DISTRICT COUNCIL

Group "A" Street Lighting: Trunk Road A.65

TENDERS are invited from experienced contractors for the following lighting work to be carried out over a length of approximately 4,725 yards of A.65 :—

The supply, erection, wiring and putting into service of a system of 400-watt Colour Corrected Mercury Vapour Lamps to Group "A" requirements, mounted on steel columns in totally enclosed lanterns, together with all necessary control gear, fuses and brackets, etc.

Contract drawings may be inspected at the office of the Engineer and Surveyor, Chantry Drive, Ilkley, from whom the contract documents may be obtained.

Tenders, in plain sealed envelopes endorsed "Street Lighting A.65," must be delivered to the undersigned not later than noon on Monday, the 29th December, 1958.

The Council do not bind themselves to accept the lowest or any tender.

B. E. TOWNEND,
Town Hall, Clerk of the Council.
Ilkley, Yorkshire.
2nd December, 1958. 5725

DURHAM COUNTY COUNCIL

TENDERS invited:—

Durham Gilesgate New Modern School. Electrical installation.

Application for further details to County Architect, South Street, Durham, not later than 24th December, 1958.

J. K. HOPE,
Clerk of the County Council.
Shire Hall, Durham. 5770

MANCHESTER CORPORATION HOUSING DEPARTMENT

TENDERS are invited (returnable on 29th December, 1958) for ELECTRICAL INSTALLATIONS to 90 dwellings at Contract 222E, Ridgway Street, Ancoats.

Particulars and documents obtainable from Director of Housing, Town Hall, Manchester. 5749

CHRISTMAS

ADVERTISEMENTS for the issue of 19th December have now closed for press.

Advertisements for 26th December are accepted up to **First Post on Thursday, 18th December**

If displayed with boxed rules, name or symbol block by **Wednesday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

AYR COUNTY COUNCIL

Trunk Road Lighting

THE County Council will shortly issue separate schedules as under in connection with the installation of lighting on Trunk Road A.78 at Loans.

1. Supply of steel standards.
2. Supply of electrical equipment.
3. Work of erection.
4. Supply of lanterns for 140-w. SO/H lamps.

Contractors to indicate to County Engineer, County Buildings, Ayr, in which contracts they are interested.

Any attempt to interlink conditionally the schedules will constitute automatic disqualification.

The County Council is not bound to accept the lowest or any offer.

IVIE McCAIG,
County Clerk. 5771

BOROUGH OF WILLESDEN

Annual Contracts

TENDERS are invited for the supply of Electrical Equipment, Cables, Conduit and Lamps for a period of twelve months ending 31st March, 1960.

Particulars and forms of tender can be obtained from the Borough Engineer, Town Hall, Dyne Road, Kilburn, London, N.W.6, and must be returned not later than Saturday, 10th January, 1959.

R. S. FORSTER,
Town Clerk.
Town Hall,
Dyne Road, Kilburn,
London, N.W.6. 5717

SITUATIONS VACANT

INSPECTOR OF LIGHTS

required by SARAWAK GOVERNMENT MARINE DEPARTMENT, either on probation to pensionable establishment or on contract with gratuity of 12½% of final monthly salary for each completed month of service. Salary scale (including inducement pay) equivalent to £1,176 to £1,932 a year. Child allowance between £72 and £123 a year. Education allowance up to £280 a year. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates, preferably under 35 and A.M.I.E.E. or A.M.I.Mech.E., should have a good all-round knowledge of electricity, especially in connection with the operation of lighthouse flashers (Chance/Londex), Reed and Klaxon motors, echo sounding gear, otherwise straightforward small unit diesel electric generation, current conversion, etc., a knowledge and experience of small diesel engines, working knowledge V.H.F. radio equipment, and have a good head for heights up to 130 feet.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/50186/EF. 5741

***Situations Vacant** (continued)*

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following positions:—

SENIOR ASSISTANT ENGINEER (Sales Development), CORNWALL GROUP (Pool, Redruth).

AGRICULTURAL ADVISORY OFFICERS OR TRAINEES: (i) SOMERSET GROUP (Taunton); (ii) DEVON GROUP (Exeter) (One vacancy at each location).

GENERAL ASSISTANT DISTRICT ENGINEERS (three vacancies), BRISTOL.

Senior Assistant Engineers (Sales Development), Cornwall Group (Pool, Redruth). Salary according to Class H, Grade 4, £1,235 × £30 to £1,325 per annum, of Schedule A of the N.J.B. agreement.

The candidate appointed will be responsible to the group commercial officer for the sales and contracting section of the group commercial department, which will include the following activities:—

Sales development, including retail trading activities, advertising display and publicity.

Technical services, including contracting, space heating, agricultural, refrigeration and commercial catering equipment.

Purchasing and stock control.

Experience in the commercial department of a district and/or branch is essential, together with a knowledge of administration, as the successful applicant will be required to deputise for the group commercial officer in his absence.

Possession of an appropriate technical qualification will be an advantage.

Applications to be made on official form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from Group Administrative Officer, South Western Electricity Board, Pool, Redruth, Cornwall. Closing date for receipt of completed applications is 31ST DECEMBER, 1958.

Agricultural Advisory Officers or Trainees: (i) Somerset Group, Taunton; (ii) Devon Group, Exeter.

Applications are invited for posts of agricultural advisory officers who will be required to advise farmers on the broad issues in which electricity can play a part in reducing operating costs and improving efficiency.

These officers will maintain contact with local representatives of agricultural organisations and will be asked to give advice to and build up good relations with agricultural dealers, contractors and merchants.

Initially, two officers are to be appointed, one at Taunton and the other at Exeter, to cover approximately the counties of Somerset and Devon. These officers will be expected, however, to give assistance in other parts of the Board's area as and when required.

Agricultural Advisory Officers. Salary according to Class AX, Grade 6, £895 × £25 to £1,020 per annum of revised schedule B of the N.J.B. agreement, with further progression to £1,080 (Class CX).

Candidates for the posts of Agricultural Advisory Officers must have:—

(a) Good practical farming experience (dairy, pig and poultry farming, including the marketing of livestock and produce, crop rotation and conservation)

and

(b) a wide experience of the operation and application of electrical equipment in farming.

Applicants should have a National or College Diploma in Agriculture or a National Diploma in Agricultural Engineering.

Trainees. Salary during training according to Class AX, Grade 8, £710 × £25 to £835 per annum of revised Schedule B of the N.J.B. agreement with further progression to £885 (Class CX).

Those with a good practical farming background (as in (a) above) but without the necessary experience of the use of electrical equipment in farming, are invited to apply for positions as trainees for a period of 1-2 years, in order to gain the necessary experience, when they will be considerd for appointment as agricultural advisory officers.

Applications to be made on official form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from Establishments Officer, South Western Electricity Board, Electricity House, Colston Avenue, Bristol, 1. Closing date for receipt of completed applications is 31ST DECEMBER, 1958.

General Assistant District Engineers (three vacancies), Bristol. Salary according to Class K, Grade 12, £835 × £15 to £880 per annum of Schedule A of the N.J.B. agreement.

The duties of each of these posts relate mainly to operation, maintenance and construction work within the Bristol District.

Previous experience of such duties, involving underground and overhead H.V. and L.V. distribution systems, preferably in urban areas, and technical qualifications at least equivalent to the Higher National Certificate, are desirable. The possession of a current driving licence or the ability to drive a car will be an advantage.

Applications to be made on official form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from District Manager, South Western Electricity Board, Electricity House, Colston Avenue, Bristol, 1. Closing date for receipt of completed applications is 31ST DECEMBER, 1958. 5798

SOUTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEERS (Planning):
(i) NORTH CORNWALL (Bodmin).
(ii) WEST CORNWALL (Camborne).
(One vacancy at each location.)

SECOND ASSISTANT DISTRICT ENGINEERS (O. & M.):
(i) EAST CORNWALL (Liskeard).
(ii) CENTRAL CORNWALL (Falmouth).
(iii) SOUTH CORNWALL (St. Austell).
(One vacancy at each location.)

Second Assistant District Engineers (Planning).

(i) North Cornwall (Bodmin). Salary according to Class E, Grade 7 (£835 × £15 to £880 per annum) of Schedule A of the N.J.B. Agreement.

(ii) West Cornwall (Camborne). Salary according to Class F, Grade 7 (£885 × £15 to £930 per annum) of Schedule A of the N.J.B. Agreement.

The successful candidates will be required to assist in the planning, research and technical work of a large, mainly rural, distribution system up to and including 33 kV, together with the preparation of capital applications and estimates.

The persons appointed will be required to undertake standby duties and will be appointed Senior Authorised Persons.

A sound knowledge of construction methods and of all types of plant and equipment is necessary.

Corporate Membership of the Institution of Electrical Engineers or equivalent qualification will be an advantage and the possession of a current driving licence is desirable.

Applications to be made on official form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from District Manager, South Western Electricity Board at the following addresses :—

For post (i), St. Petrocs, Bodmin.
For post (ii), 13, Bassett Road, Camborne.

Closing date for receipt of completed applications is 31st December, 1958.

Second Assistant District Engineers (O. & M.).
(i) East Cornwall (Liskeard).
(ii) Central Cornwall (Falmouth).
(iii) South Cornwall (St. Austell).

Salary according to Class E, Grade 7 (£835 × £15 to £880 per annum) of Schedule A of the N.J.B. Agreement.

Applicants should be thoroughly familiar with the operation and maintenance of urban and rural supply networks up to 33 kV, underground and overhead, including substation equipment, protective gear, fault localisation and safety regulations, and must also be accustomed to the control of men and the systematic keeping of adequate records.

Corporate Membership of the Institution of Electrical Engineers or equivalent qualification will be an advantage and the possession of a current driving licence is desirable.

Applications to be made on official form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from District Manager, South Western Electricity Board at the following addresses :—

For post (i), Luxstowe, Liskeard.
For post (ii), 6, Grove Place, Falmouth.
For post (iii), 9, Fore Street, St. Austell.

Closing date for receipt of completed applications is 31st December, 1958. 5774

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

FOURTH ASSISTANT ENGINEER, TECHNICAL DEPARTMENT
(Vacancy No. 179/58/ER).

The minimum technical qualification required is the Higher National Certificate in Electrical Engineering, and preference will be given to candidates who have completed a recognised postgraduate apprenticeship.

Experience of higher voltage switchgear and protective gear will be an advantage.

The successful candidate will be required to reside in or near Leicester.

The salary will be in accordance with Class AX/EX, Grade 8 (£710–£935 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 17th December, 1958.

THIRD ASSISTANT ENGINEER, TRANSMISSION (Construction) DEPARTMENT
(Vacancy No. 186/58/ER).

Duties will be connected with the construction of high-voltage transforming and switching substations and will include contractual correspondence and site supervision. Candidates should have experience in construction or maintenance of similar plant and should possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be within Class AX/EX, Grade 6 (£895–£1,140 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 27th December, 1958.

PLANT SHIFT CONTROL ENGINEERS, DRAKELOW "A" POWER STATION
(Vacancy No. 187/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National standard desirable.

The salary will be in accordance with Class J, Grade 10 (£885 - £930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th December, 1958.

STATION SHIFT CONTROL ENGINEERS, DRAKELOW "A" POWER STATION
(Vacancy No. 188/58/ER).

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

The salary will be in accordance with Class J, Grade 10 (£885 - £930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th December, 1958.

STATION SHIFT CONTROL ENGINEER, WILLINGTON "A" POWER STATION
(Vacancy No. 184/58/ER).

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

The salary will be in accordance with Class K, Grade 10 (£935-£995 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th December, 1958.

These appointments will be pensionable under the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

O. S. WOODS,
Divisional Controller.

3rd December, 1958. 5737

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area
GOOLE DISTRICT

FIRST ASSISTANT DISTRICT ENGINEER. Applicants should be experienced in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary apparatus.

The successful applicant will be responsible to the District Engineer and must be capable of preparing complete schemes and estimates. He will be required to reside in the Goole District and undertake standby duty.

Applicants should be Corporate Members of the Institution of Electrical Engineers, or possess equivalent qualifications.

Salary N.J.B. Class E, Grade 5, £935/£20/£995 per annum.

Applications, quoting 6 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 29th December, 1958.

No. 7 (Grimsby) Sub-Area
GAINSBOROUGH DISTRICT

DISTRICT COMMERCIAL ENGINEER. Candidates must be capable of conducting the development of a district, supervising a district commercial organisation and have sound experience covering:—

(a) Consumer service.
(b) Industrial and commercial development of electricity supply.
(c) Control of service centre sales and staff.
(d) Control of electrical contracting and maintenance Department and staff.
(e) Administration and operation of hire and hire purchase schemes.

An appropriate technical qualification would be an advantage.

Salary N.J.B. Class E, Grade 4, £995/£20/£1,055 per annum.

GRIMSBY AND SCUNTHORPE DISTRICTS

SECOND ASSISTANT DISTRICT ENGINEERS (Two Posts). Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound training and extensive experience in the operation, design, construction and maintenance of H.V. and L.V. underground and overhead distribution systems, substation plant and ancillary equipment in both urban and rural areas.

Salary N.J.B. Class G, Grade 7, £935/£20/£995 per annum.

SUB-AREA HEADQUARTERS

SECTION LEADER (Electrical). Applicants should have experience in the electrical layout of substations and the preparation of diagrams for electrical equipment.

The successful applicant will be required to supervise the staff engaged on the above work and should hold an appropriate qualification in electrical engineering.

Salary N.J.B. Schedule D, Grade 4, £895/£20/£995 per annum.

SCUNTHORPE AND GRIMSBY (LOUTH) DISTRICTS

THIRD ASSISTANT DISTRICT ENGINEERS (Two Posts). Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary N.J.B. Class G, Grade 9, £835/£15/£880 per annum.

GAINSBOROUGH DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER. Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary N.J.B. Class E, Grade 9, £740/£15/£785 per annum.

Applications, quoting 7 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 29th December, 1958.

No. 3 (Sheffield) Sub-Area

SENIOR DRAUGHTSMAN (Civil and Building). Applicants should have had a good general and technical education to at least O.N.C. standard, with drawing office experience in the work associated with the design and construction of substation, office and other buildings.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

SENIOR DRAUGHTSMAN (Electrical). Applicants should have had a good general and technical education to at least O.N.C. standard, with experience in the electrical layout of substations and the preparation of diagrams for electrical equipment.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

Applications, quoting 3 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 29th December, 1958. 5782

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(a) STATION SHIFT CONTROL ENGINEER, ACTON LANE POWER STATION (Vacancy No. 58/1018).

Candidates should possess good technical qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear. Salary Class J, Grade 10 = £935 plus £88 10s. shift per annum.

(b) POWER STATION SUPERINTENDENT, BLACKWALL POINT POWER STATION (Vacancy No. 58/1019).

Applicants should have had a wide experience of power station operation, maintenance and administration, and should have a lively sense of responsibility in management/employee relations. Salary N.J.M. & H.E. scale, A.5 = £1,560/£1,760 p.a. (N.J.M.C. conditions of service).

(a) ASSISTANT ENGINEER (Operation), WEST HAM POWER STATION (Vacancy No. 58/1020).

Good technical training and practical experience of power station operation. Duties will include relief for other shift technical operating staff. Salary Class H, Grade 10 = £885 plus £83 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 22nd December, 1958. 5738

OVERHEAD LINES SUPERVISOR

required for services with the
SUDAN LIGHT & POWER CO. LTD. IN KHARTOUM.

Salary range £S.900 - £S.1,200.

Applicants should be between the ages of 28 and 40, of strong physique, with good experience of the construction and maintenance of H.T. overhead lines up to 33 kV, and must be prepared to work under arduous conditions. Experience on transmission lines up to 132 kV would be an added advantage. Appointment will be on contract for three years with possible extension, with a bonus payable on completion of the contract period.

A cost-of-living allowance will be payable in addition to salary.

A kit allowance of £S.50 will be payable on appointment.

Free living accommodation with basic furniture or an allowance in lieu thereof.

After satisfactory completion of the first 18 months liberal leave on full salary with free passage.

There is at present no income tax in the Sudan.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary, with names of two referees, should be submitted to the Secretary, The Power & Traction Finance Co. Ltd., Queens House, 28, Kingsway, London, W.C.2. 5755

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Birmingham and District Sub-Area

SENIOR DRAUGHTSMAN
(Sub-Area Engineer's Department).

Applicants should have a sound experience in the preparation of engineering drawings required for the construction and operation of transmission and distribution networks and their associate substations. Knowledge of surveying and mains records routine will be considered an additional qualification. Salary £760/£860 per annum (N.J.B. Schedule D, Grade 5).

Apply by letter within 7 days, stating age, experience, salary and present position to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Shropshire and Herefordshire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Hereford District).

Applicants will be required to assist in the planning, construction and maintenance of H.V. and L.V. overhead and underground cables. Technical qualifications desirable. Salary £590/£635 per annum (N.J.B. Grade F.13).

Apply by letter within 14 days, stating age, experience, present salary and position, to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

South Staffs and North Worcs Sub-Area

SENIOR ASSISTANT ENGINEER
(Planning and Operations)
(Headquarters).

The successful applicant will be responsible for the operation of the Sub-Area H.V. system and the planning of major and other engineering schemes. Applicants should have had sound technical training. Experience in the operation of an extensive H.V. distribution system and in the planned development of H.V. and L.V. systems in a heavy industrial area is desirable. Preference will be given to candidates having appropriate qualifications including Corporate Membership of the I.E.E. Salary £1,560/£1,665 per annum (N.J.B. Grade L.4).

Apply by letter within 14 days, stating age, experience, qualifications, present position and salary, to Mr. H. A. P. Caddell (Ref. CW), Sub-Area Manager, Midlands Electricity Board, Toll End Road, Tipton, Staffs.

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Wolverhampton District).

Applicants should have had a sound technical training and experience in the construction, maintenance and operation of overhead and underground systems and substations. Technical qualifications desirable. Salary £635/£680, £685/£730 or £740/£785 per annum (N.J.B. Grades H.14, H.13 or H.12) according to qualifications and experience.

Apply by letter within 14 days, stating age, qualifications, experience, present position and salary, to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington St., Wolverhampton.

A. STEPHENS,
Secretary. 5764

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPLICATIONS are invited for the position of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Hamilton District.

Applicants should be engineers with commercial experience and preferably should hold an appropriate engineering qualification. The position is superannuable.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A; Classification and Grading E.5, salary £935/£995 per annum.

The successful applicant will require to reside within a reasonable distance of the Hamilton district office.

Forms of application which may be obtained from the undersigned or any other Area Manager, should be forwarded to this office not later than 31st December, 1958.

R. J. RENNIE,
Manager.
Montrose Crescent,
Hamilton.
4th December, 1958. 5777

***Situations Vacant** (continued)*

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 9 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.950, not later than 22nd December, 1958.

General Assistant Engineer

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 13, Schedule A (£590-£635 per annum. N.J.B. conditions of service.

The duties of the post will be to assist with distribution duties including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. This appointment may involve standby duties. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.957, not later than 22nd December, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 5783

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Burton Street, Nottingham

Principal:
D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

Electrical Engineering Department

VACANCIES exist on the full-time staff for:
2 SENIOR LECTURERS.
1 LECTURER.
1 ASSISTANT LECTURER GRADE B.

The department covers a wide range of electrical subjects, hence candidates with varying types of experience will be considered. Established sandwich courses specialising in power and telecommunications are being further developed.

Salaries in accordance with the Burnham Technical Scale as follows:—

Senior Lecturer: £1,350 rising by annual increments of £50 to £1,550 per annum. A salary above the minimum will be paid in approved cases.

Lecturer: £1,200 rising by annual increments of £30 to £1,350 per annum. A salary above the minimum will be paid in approved cases.

Assistant Grade B: £650 × £25 to £1,025 per annum. Additions for assistants include degree allowance of £75 per annum (or £125 for good honours degree), up to 3 increments of £25 for training in approved cases and incremental allowance for industrial experience after age 21, and war service.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 16th January, 1959. 5785

BERMUDA ELECTRIC LIGHT CO. LTD.

Cable Jointer

THE company have a vacancy for a 1st class high (to 33 kV) and low tension cable jointer. Three-year contract offered in first instance.

Assistance will be given by the company to find unfurnished accommodation if necessary. Pension scheme operated.

Applicants should forward full details of themselves, their training and experience to: Messrs. Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting reference 2203/61. 5784

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Norfolk Sub-Area Headquarters

GENERAL ASSISTANT ENGINEER, CROMER (131/58.R.).

Applicants should have had a sound technical training and possess the Higher National Certificate or equivalent qualification.

Salary N.J.B. Class K, Grade 14 (£740-£785).

Apply by letter to The Manager, Norfolk Sub-Area, Eastern Electricity Board, 4, Duke Street, Norwich, by 28th December, 1958.

Northmet Sub-Area Headquarters

(a) FOURTH ASSISTANT ENGINEER (Planning) (Ref. 818) (132/58.R.).

(b) FOURTH ASSISTANT ENGINEER (Operation and Maintenance) (Ref. 819) (135/58.R.).

For post (a) candidates should have had a sound technical training up to at least Higher National Certificate standard, have a knowledge of substation plant and protective gear, be experienced in the design and layout of substations, and be capable of supervising site works.

For post (b) candidates should have had a good general and technical education and possess the Higher National Certificate or equivalent qualification. Previous experience in the carrying out of switching operations, testing and commissioning of protective gear, and fault investigation in the field on mains and plant is necessary.

Salary N.J.B. Class M, Grade 13 (£885-£930) plus London allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 22nd December, 1958. 5766

ASHLEY ACCESSORIES LIMITED

Ulverston, Lancashire

MANUFACTURERS of mass production ELECTRICAL WIRING ACCESSORIES AND ASSOCIATED PRODUCTS in a modern plant situated in the Lake District.

The following appointments, which are due to expansion in the design team, carry good salaries and prospects. Housing will be available, together with settling-in allowance and optional pension scheme.

(1) CHIEF ELECTRICAL DRAUGHTSMAN.
To take an active part in the work of design from initiation of an idea on the drawing board with liaison through laboratory to production stages. The work calls for keen interest in the field of design for large quantity production.

(2) ELECTRICAL DESIGNER-DRAUGHTSMEN.
Able to develop ideas on the drawing board and take an active interest in the associated laboratory work.

All applications will be treated in strict confidence and should be addressed to Chief Engineer. 5678

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the superannuable position of MAINTENANCE ENGINEER (Electrical) at Clyde's Mill Generating Station, Cambuslang, near Glasgow.

Applicants should have had considerable experience in the maintenance of electrical equipment in generating stations and, preferably, possess a Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class K, Grade 6, £1,235/£1,325 per annum.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and returned not later than 27th December, 1958. 5744

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

Vacancies for Charge Engineers

THE TRINIDAD AND TOBAGO ELECTRICITY COMMISSION has vacancies for CHARGE ENGINEERS at its Generating Station at Penal.

Applicants should have experience in the operation of modern steam turbines, water tube boilers and diesel generators, and must have Graduate Membership of the I.E.E. or I.Mech.E. or Associate Membership of the I.Mar.E., or the Higher National Certificate in Mechanical Engineering or Second Engineer's M.O.T. Diesel and Steam Certificate or R.N. equivalent.

The annual salary is £1,310 rising by annual increments of £40 to £1,430.

A partly furnished house will be provided at a rent of £10 8s. 4d. per month plus a small extra charge for heavy furniture.

An outfit allowance of £60 is paid on arrival in Trinidad.

First class passages to Trinidad will be provided for the successful applicant, his wife and three children. First class leave passages to the United Kingdom will be provided every three years.

There is a superannuation scheme similar to the C.E.A. and Area Boards' scheme.

Information on Trinidad can be obtained from the West India Committee, 40, Norfolk Street, London, W.C.2.

Applications giving full details of qualifications, age, experience, etc., together with two recent testimonials, should be sent by air mail to reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, T.W.I., by 21st January, 1959. 5726

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointment in this Division :—

PLANT SHIFT CONTROL ENGINEERS,
DRAKELOW "B" POWER STATION
(Vacancy No. 189/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience. Technical qualifications to Higher National Certificate desirable. The ultimate capacity of this station will be 480 MW.

Salary will be in accordance with Class J, Grade 10 (£885-£930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th December, 1958.

This appointment will be pensionable under the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

O. S. WOODS,
Divisional Controller.

4th December, 1958. 5762

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS, Sevenoaks and Reigate District.

(a) Salary £790-£835 per annum under N.J.B. agreement, Class F, Gr. 9.

(b) Salary £685-£730 per annum under N.J.B. agreement, Class F, Gr. 11.

Applicants for either appointment should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV in rural and urban areas. The appointments are superannuable and entail standby duties.

Applications quoting reference TER, and naming 2 referees, on forms from District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 23rd December, 1958.

GEORGE WRAY,
Secretary. 5778

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments :—

Wear Sub-Area

FOURTH ASSISTANT ENGINEER, Construction Section, Sub-Area Headquarters. Applicants should have a qualification equivalent to H.N.C. in Electrical Engineering and experience in construction of H.V. and L.V. overhead lines and installation of underground cables. Knowledge of switchgear erection and equipping of substations, etc., an advantage.

Salary Schedule A, Class L, Grade 13, £835/£880. N.J.B. conditions of service.

Tees Sub-Area

SUB-AREA TRANSPORT OFFICER, with location at Transport Depot, Stockton. Applicants should have had experience in organisation and control of a large transport depot and be thoroughly conversant with modern practices in repair and maintenance of a large fleet of private cars, light commercial and diesel and petrol-driven heavy transport vehicles.

Salary Schedule A, Class K, Grade 10, £935/£995. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 5742

COLLEGE OF TECHNOLOGY, BIRMINGHAM

(Designated College of Advanced Technology)

Department of Electrical Engineering

APPLICATIONS are invited for the following posts :—

SENIOR LECTURER.
LECTURER.
ASSISTANTS GRADE B.

Salary Scales :—
Senior Lecturers (Men), £1,350 × £50 to £1,550.
Lecturers (Men), £1,200 × £30 to £1,350.

In fixing the commencing salary account may be taken of industrial, professional or research experience up to the maximum of the scale.

Grade B (Men), £650 × £25 to £1,025, with additional graduate and training allowances where applicable. In fixing the commencing salary account will be taken of teaching and industrial experience.

Further particulars and forms of application from the Registrar, College of Technology, Gosta Green, Birmingham, 4. Applications to be received within 18 days of this advertisement. Please quote G.

K. R. PILLING,
Clerk to the Governing Body.
5765

INDEPENDENT TELEVISION AUTHORITY

APPLICATIONS are invited for the post of ENGINEER in the Headquarters Lines Group based in the London area.

Applicants, who should hold a degree, H.N.C. or equivalent qualification in electrical engineering, should be familiar with transmission techniques and methods of performance, testing long vision and sound circuits. Some operational experience in television broadcasting would be an advantage.

The salary scale for this appointment is £825-£1,160 per annum. Contributory pension scheme. Applications should be submitted to the Personnel Officer, 14, Princes Gate, London, S.W.7. 5719

UNIVERSITY OF NOTTINGHAM

SENIOR or CHIEF TECHNICIAN required as steward in charge of the electrical and electronic workshops, photographic laboratory and stores, and to supervise the technical staff. Candidates should be widely experienced and preferably possess a Higher National Certificate or equivalent qualification. Salary within the scale £590 to £690, or £715 to £795. Conditions of appointment and form of application, to be returned as soon as possible, from the Registrar. 5780

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. stations. Qualifications required : (a) O.N.C. Elec. or Mech. or equivalent; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance of high and medium-voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Promotion and pensionable prospects and opportunities for overseas tours for which special allowance payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 55 years. Write giving age, full details of qualifications and experience, quoting (PE.3140), to Manager, Ministry of Labour and National Service, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. 398

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer
Northamptonshire Sub-Area

APPLICATIONS are invited from suitably qualified and experienced engineers for the appointment of a FOURTH ASSISTANT ENGINEER at the Northamptonshire Sub-Area Headquarters.

The duties of the position will be to assist in the construction, operation and maintenance of underground and overhead systems operating mainly at 33 kV.

The conditions of service and salary will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835 × £15 to £880 per annum).

Applications stating age, qualifications, previous experience, present position and salary should be forwarded to the Manager, Northamptonshire Sub-Area, East Midlands Electricity Board, 25, Bridge Street, Northampton, so as to reach him within fourteen days of the publication of this notice. 5781

ALDERNEY ELECTRICITY LTD.

Alderney, Channel Islands

RESIDENT MANAGER required for Statutory Island Electricity Supply Company with output approaching one million units per annum from an A.C. diesel generating station. The distribution network consists of overhead and underground 11 kV and L.V. mains. One showroom. Contracting carried out. Applicants should be energetic practical engineers with operating and contracting experience. The company is associated with and guided by Christy Bros. Ltd.

Starting salary approx. £750 p.a. having regard to applicant's experience with progressive increases depending on results obtained.

Full details of age, experience, qualifications and salary required should be given in the application which should be made in writing to Christy Bros. Ltd., Electrical Engineers, Chelmsford, Essex, England. 5799

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

FOURTH ASSISTANT ENGINEER, SWINDON AREA, TECHNICAL DEPT. (Sec/3.8). Applicants should have had experience of electrical engineering in relation to protective gear including testing, and knowledge of modern switchgear practice is desirable. Applicants should be studying for H.N.C.

Salary N.J.B. Class AX/DX, Grade 8, £710-£910 per annum.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 31st December, 1958. 5767

SIEMENS EDISON SWAN LIMITED

(An A.E.I. Company)

Research Laboratory

CABLE RESEARCH ENGINEER OR PHYSICIST

required with a special interest in high-voltage insulation to work on aspects of insulation failure and cable design. Practical experience and theoretical interest desirable.

A competitive salary will be offered and ideal working conditions in a new well-equipped research laboratory. Housing available to rent or purchase.

An opportunity to discuss this situation may be arranged by writing to—

The Personnel Officer
SIEMENS EDISON SWAN RESEARCH LABORATORY
West Road, Temple Fields, Harlow Essex

5763

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointments in the Transmission Section of the Chief Engineer's Department. Candidates for these posts should be in possession of a Higher National Certificate in Electrical Engineering.

1. FOURTH ASSISTANT ENGINEER (Head Office, Glasgow) (Ref. No. E46/58).

Candidates should have had experience in the electricity supply industry and/or with a firm of electrical manufacturers.

2. FOURTH ASSISTANT ENGINEER (Kilmarnock (Ref. No. E47/58).

Preference will be given to candidates with experience on 132 kV lines and substations.

Salary £710/£935 per annum in accordance with Class AX/EX, Grade 8 of Schedule B to the National Joint Board Agreement.

Apply, quoting appropriate reference number on standard form AE6, available from the Secretary, P.O. Box No. 173, 351 Sauchiehall Street, Glasgow, C.2, not later than Saturday, 20th December, 1958. 5779

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

DORMAN LONG (STEEL) LTD.

require a working

CHARGEHAND ARMATURE WINDER

at their new Lackenby Works, having sound knowledge of all A.C. and D.C. windings, including equipment used in steelworks, and rolling mill drives up to 8,000 h.p.

Send fullest details to LABOUR OFFICER, LACKENBY WORKS, GRANGETOWN, MIDDLESBROUGH. 80

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

Appointment of Third Assistant Engineer, Technical Department (Protective Gear and Electrical Plant Testing)

APPLICATIONS are invited for the above appointment with Headquarters at Darlington. Applicants should possess qualifications of Graduate I.E.E. standard and have had experience in the testing and maintenance of electrical plant and protective gear in generating stations, and of transmission systems.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 5 (£1,055-£1,285) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 31st December, 1958. 5788

CENTRAL ELECTRICITY GENERATING BOARD

Yorkshire Division

APPLICATIONS are invited for an appointment as FOURTH ASSISTANT ENGINEER in the Transmission Department, Divisional Headquarters, Leeds.

Applicants should have had a sound technical and practical training with experience in the surveying, setting out and erection of lattice steel overhead transmission lines. Preference will be given to candidates who possess a Higher National Certificate or equivalent qualifications.

Commencing salary within the following scales of the National Joint Board Agreement, according to qualifications and experience:—

£810-£935 per annum, Class AX, Grade 7, rising to £1,035 per annum (Class EX).

£710-£835 per annum, Class AX, Grade 8, rising to £935 per annum (Class EX).

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 10 days of the appearance of this advertisement. 5768

INSPECTOR OF WORKS (ELECTRICAL)

required by NYASALAND GOVERNMENT Public Works Department on contract for one tour of 2 to 3 years with prospect of pensionable employment.

Salary scale £985 rising to £1,245 a year. Outfit allowance £30. Free passages for officer and wife and assistance towards children's passages. Liberal leave on full salary.

Candidates, between 27-40 years of age, must have served a full trade apprenticeship as an electrician and have had good subsequent experience of the installation of internal wiring systems; the installation and running of plant and machinery operated by electric motors of up to 25 h.p.; the planning of wiring layouts and the preparation of estimates of cost and specifications. Experience in design and erection of transmission systems an advantage. O.N.C. (Elect.) or equivalent desirable.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/50419/EF. 5773

NORTH EASTERN ELECTRICITY BOARD

Area Board Headquarters

APPLICATIONS are invited for the appointment of FOURTH ASSISTANT ENGINEER, Chief Engineer's Department, Technical Section, Carliol House, Newcastle-upon-Tyne.

Duties include general technical work in connection with protection of H.V. apparatus and calculations of fault currents and protection settings on H.V. systems. Applicants should possess H.N.C. in Electrical Engineering.

Salary Schedule B, Class AX, Grade 8, £710/£910. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle-upon-Tyne, within ten days of the appearance of this advertisement. 5776

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

GENERAL ASSISTANT ENGINEERS, GOLDINGTON GENERATING STATION.

Salary Class H within the range of Grades 15/14, £590 × £15 to £680 p.a.

The commencing salary will depend upon the duties and responsibility.

Duties include assisting in the electrical control room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., and provide a suitable basis for promotion to higher technical grades.

Applications, quoting reference 2/9955, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 27th December, 1958. 5740

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

FOURTH ASSISTANT ENGINEER required in the System Development Section of the Technical Department at Divisional Headquarters, Bristol.

Superannuation scheme. Salary N.J.B. Class AX/DX, Grade 7, £810 - £935/£1,010.

Applicants should possess qualifications leading to A.M.I.E.E. Candidates should have a sound knowledge of transmission theory and should be interested in system design, and preferably have practical experience on protective systems. Experience on protective gear co-ordination and on the use of D.C. calculators is desirable.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 20th December, 1958. 5787

DESIGNER/DRAUGHTSMAN

with experience in design of air break circuit breakers up to 2,000 amperes for medium-voltage A.C. applications and complying with B.S. and A.S.T.A. requirements.

This post is permanent and offers excellent opportunity for man with initiative capable of accepting responsibility and working with minimum supervision.

Salary commensurate with experience and technical qualifications.

Married men will receive assistance towards house purchase if necessary. Applications treated in strict confidence.—Box 615, Rex Publicity, 10, Clairmont Gardens, Glasgow, C.3.

354

NORTH EASTERN ELECTRICITY BOARD

Tees Sub-Area

APPLICATIONS are invited for the appointment of FOURTH ASSISTANT ENGINEER, Planning and Development Section, Thornaby-on-Tees.

Applicants should have received training in electricity supply industry and should possess H.N.C. in Electrical Engineering. The successful applicant will be required to assist in the planning of H.V. and L.V. overhead and underground distribution systems and to undertake investigations for the preparation of reinforcement schemes.

Salary Schedule A, Class K, Grade 13, £790/£835.

Applications stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle-upon-Tyne, within ten days of the appearance of this advertisement. 5775

CLERK OF WORKS (ELECTRICAL) TECHNICAL GRADE III

required by the War Department

A CLERK OF WORKS (Electrical) Technical Grade III is required by the War Department (Eastern Command) for employment in HOUNSLOW on design and planning of minor external and internal electrical installations; checking of contracts.

Salary scale £695 (age 26) rising to a maximum of £870 p.a. (London rate). 5-day week.

Starting salary £695 (age 26), £720 (age 27), £745 (age 28 and above).

Qualifications: (a) Ordinary National Certificate in Electrical Engineering or equivalent; (b) Five years' apprenticeship or equivalent with an engineering concern giving good comprehensive training; (c) After completing apprenticeship, at least three years with an engineering firm giving good comprehensive experience or three years' service as a supervisor of labour.

Applications stating age, training and experience to Chief Engineer, H.Q. Eastern Command, Cavalry Barracks, Hounslow, Middlesex. 5727

BRITISH STANDARDS INSTITUTION

Technical Staff

THE B.S.I. invites applications from Electrical Engineers to join the technical staff of the Institution. The technical staff are responsible for the work of the Institution in the preparation of British Standards in co-operation with the various sections of industry and are required to plan and progress the work.

Applicants should have a university degree or equivalent professional qualification in electrical engineering, and experience in electronics.

There are three grades of appointment, with an overall salary range up to £2,000; applications are invited for the grade which has at present a maximum salary of £1,250, the starting figure being dependent on individual qualifications and experience. The posts are pensionable.

Apply to the Establishment Officer, B.S.I., 2, Park Street, London, W.1. 5729

PATENT OFFICE: EXAMINERS

(Men and Women)

for scientific, technical and legal work on Patent applications. Age between 21 and 35; extension for Regular Forces service and Overseas Civil Service.

Qualifications: normally first or second class honours degree in physics, chemistry, engineering, metallurgy or mathematics, or equivalent attainment, or professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C.

London salary (men) £635-£1,410; provision for starting pay above minimum. Good promotion prospects.

Apply Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting S128/58 and stating date of birth. 5752

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

SHIFT CHARGE ENGINEER is required at Ocker Hill Power Station, Tipton, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G7, £935-£995 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate qualifications desirable.

Apply, quoting vacancy number 895MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 29th December, 1958. 5786

ELECTRICAL WHOLESALE BUYER

ELECTRICAL wholesalers in West Herts require experienced buyer and negotiator, salary range £900/£1,200 according to experience. Housing accommodation could be provided. Age limit 35 years. Only those having occupied a similar position need apply.—Box 5730.

CENTRAL ELECTRICITY GENERATING BOARD

APPLICATIONS are invited for appointments as ASSISTANT INSTRUMENT MAINTENANCE ENGINEERS at the Board's Nuclear Power Stations.

A good theoretical background is required, together with organising ability and a practical knowledge of instrument engineering.

The successful candidates will be required to attend appropriate theoretical and practical courses of training prior to appointment to a nuclear power station where they will work under the immediate direction of the Instrument Maintenance Engineer.

Salary within range £1,235-£1,325 p.a.

Application forms obtainable from I. G. Ellis, Personnel Officer, 24/30, Holborn, London, E.C.1, to be returned by 29th December, 1958. Please mark envelopes "Confidential, Reference ER/378." 5728

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Fourth Assistant Engineer

APPLICATIONS are invited for the above post at Perth in the Chief Electrical and Mechanical Engineer's Department. The duties would include commissioning and maintenance of equipment and protective gear associated with generation and transmission plant on the Board's 132-kV, 33-kV and 11-kV systems, and other technical matters. Corporate Membership of the Institution of Electrical Engineers or qualifications leading to it preferred.

Salary commencing at a point within the range £710 - £885 (N.J.B. Schedule B, Class AX/CX, Grade 8), depending on experience and qualifications. Superannuation scheme.

Application forms, obtainable from the Secretary, 16, Rothesay Terrace, Edinburgh, 3, should be returned by 31st December, 1958. 5751

H.M. INSPECTORS OF SCHOOLS: MINISTRY OF EDUCATION

NON-contributory pensionable posts for England only. Men and women preferably under 45.

Appropriate professional qualifications and teaching and practical experience desirable in Agriculture, Architecture, Building, Catering and Food Technology, Chemistry, Electronics, Engineering (Chemical, Mechanical, Electrical or Production), Management Studies, Metallurgy or Mining.

Men's starting salary (London) £1,530 rising to £2,250. Appointments may be made above the minimum. Higher posts filled by promotion; also some with £140 allowance.

Write Secretary (Inspectors' Section), Ministry of Education, Curzon Street, London, W.1. Closing date 31st January, 1959. 5718

CONTROL ROOM TECHNICIANS

are required by the UNITED KINGDOM ATOMIC ENERGY AUTHORITY, INDUSTRIAL GROUP, at Chapelcross Works, Annan, Dumfriesshire, Scotland, to be responsible, on shift, to the System Control Supervisor for general duties in a power station electrical control room, including synchronising and loading of turbo-alternators, E.H.V. remote switchgear and meter reading.

A recognised engineering apprenticeship and some experience of power station electrical control rooms are essential. Possession of an O.N.C. or equivalent may be an advantage.

Salary between £700 (at age 26) and £875.

Contributory superannuation. Staff housing scheme.

Send postcard for application form, quoting reference 2774/J7, to Works Secretary, at above address.

Closing date 22nd December, 1958. 5720

ELECTRICAL ENGINEERS

required for Engineering Department of Automatic Motor Control Gear Makers in West Midlands.

The work comprises the derivation of schematic diagrams, selection and layout of components and issue of works manufacturing instructions.

A pension scheme is in operation and assistance towards removal expenses will be paid in approved cases.

Apply in confidence stating age, experience and salary required to—Box 5590.

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 132/ER/58

APPLICATIONS are invited for the post of POWER STATION SUPERINTENDENT at CARMARTHEN BAY POWER STATION, BURRY PORT, CARMS. The station has a capacity of 345 MW.

The salary will be in accordance with Class C, Grade 5 of the National Joint Managerial and Higher Executive Grades Committee (£1,900-£2,100 per annum).

Applications, stating details of engineering and management training and experience, should be addressed to the Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd., Gabalfa, Cardiff, so as to reach him not later than 23rd December, 1958. 5739

ELECTRICAL CONTRACTORS' SUPERVISING ENGINEER

OLD-established electrical contractors in North London area, permanent staff of 120 employees, require a Supervising Engineer age 30-35 years to join them. Ultimate prospects are advancement to a managerial position to replace existing personnel on their retirement. The applicant must have had experience of estimating, site supervision, final account preparation, customer contact at executive level and general all-round knowledge of electrical contracting.

Salary, according to ability and experience, £1,000/£1,500 per annum. Car provided. Housing available if required.

Apply stating age and giving details of previous experience.—Box 5731.

ELECTRICAL ENGINEERS

required for Technical Tendering Department of Automatic Motor Control Gear Makers in West Midlands.

The work comprises the initial engineering of control schemes, the calculation of their cost and the preparation of tenders.

A pension scheme is in operation and assistance towards removal expenses will be paid in approved cases.

Apply in confidence stating age, experience and salary required to—Box 5591.

EAST AFRICA

ELECTRICAL ENGINEER/ESTIMATOR required for service with progressive contracting company.

Applicants must be capable of estimating for large contracts and taking complete charge of a branch. Remuneration commensurate with experience and qualifications.

Write giving full personal details, experience, etc., to—Box 5754.

CITY OF NORWICH

FOREMAN ELECTRICIAN required in the City Engineer's Department to supervise street lighting and other electrical installations and maintenance. Wages £12 9s. 4d. for a 44-hour week.

Applications in writing, giving full particulars, to the City Engineer, City Hall, Norwich, by 10 a.m. on 22nd December. 5769

ASSISTANT electrical engineer required by steel tube manufacturers in Birmingham, to be responsible for all electrical maintenance and repairs, including a large number of overhead cranes and other lifting appliances, total over 7,000 kVA. Applicants must be between the ages of 24 and 30, have a university degree or equivalent, and have served a recognised apprenticeship or training for at least 3 years in electrical engineering. Contributory pension scheme. Apply stating age, qualifications, experience and salary required to the Personnel Manager, Tubes Limited, Rocky Lane, Aston, Birmingham, 6. 5646

ATLAS LIGHTING Limited require technicians for interesting work in lamp development laboratory situated in North London. Previous experience an advantage. Apply in writing to WJM/LED, Atlas Lighting Limited, Angel Factory Colony, Angel Road, London, N.18, stating qualifications and previous experience. 5733

ASSISTANT estimator required by City (London) contractors. Excellent prospects for young engineer willing to work hard in the office and on sites.—Box 5789.

ASSISTANT works engineer required by Granada Group. Qualified man, age 24 to 30, with good experience of electrical installation and maintenance work. Knowledge of heating and ventilation desirable. The position is based in London and work will cover engineering services in theatres, offices, shops, etc. Good salary. Superannuation scheme. Write stating details of previous employment to—C. W. Sully, A.R.I.B.A., 149, Regent Street, London, W.1. 5732

BRENTFORD TRANSFORMERS Ltd. have a vacancy for a senior sales engineer. The position which is well paid and offers chance of promotion, pension scheme and local accommodation, is open to a man with a good engineering knowledge in the control and rectifier field. A certain amount of organising ability is also required. Applications to—Sales Director, B.T.L., Manor Royal, Crawley, Sussex. 5705

CIRCUIT engineer. Young man, age 22/26, required for circuitry work associated with automatic control gear. O.N.C. standard preferred. Permanent and progressive position. Pension scheme. Canteen. Apply in writing giving full details of age, experience and qualifications, if any, to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Rd., Hounslow, Middlesex. 5593

CLERK with knowledge of installation materials. Write details of experience, age and salary required to—The Phœnix Electrical Co. (London) Ltd., Marshalsea Road, London, S.E.1. 5790

COMMERCIAL assistants (engineering) required by the British Thomson-Houston Co. Ltd. The work involves the handling of enquiries and orders for small industrial electric motors, both home and export. Some knowledge of electrical engineering practice would be of advantage and applicants should have a minimum of National Certificate of Education at Ordinary level. The vacancies are open to men not over 30 years of age who are free of National Service commitments. Continuity of employment and good prospects are assured in this expanding department. Superannuation scheme. Apply to Sales Manager, Small Industrial Machines Dept., The British Thomson-Houston Co. Ltd., Blackheath, Birmingham. 5756

COMMERCIAL electrical engineer required by merchant company for Malaya. Minimum qualification O.N.C.; age up to 26; bachelor. Good salary, scale according to qualifications and experience, and excellent prospects. Annual increments; provident fund; pension scheme; free furnished accommodation; passage provided. Write—Box 1822, c/o Abbotts, Eastcheap, London, E.C.3. 5757

CONSULTING engineers have vacancy for an assistant electrical engineer to be attached to their Inverness office on site work associated with hydro-electric power plant and main transmission substations. A young engineer age 25-30 years, having a degree or equivalent qualification and some practical experience of power engineering, is required. Applicants please submit details of training and experience to—Kennedy & Donkin, 3, North Charlotte Street, Edinburgh, 2. 5706

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Experience of lift equipment would be an advantage. Permanent and progressive position. Good salary. Canteen. Pension scheme. Write stating age, experience and qualifications, if any, to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Rd., Hounslow, Middx. 5721

DESIGNER draughtsman. Due to expansion, opening occurs for better than average engineer to join enterprising and enthusiastic team in design, pricing and site execution of electrical installations for all classes of buildings. Creative mind and accuracy essential for this interesting and high calibre work. Write full particulars of experience, age, training and salary required—(M.D.), Alliance Electrical Co. Ltd., 2, Henrietta Street, London, W.C.2. 65

DRAUGHTSMEN required by manufacturers of medium-voltage metalclad switchgear for their contracts drawing office. Bonus and non-contributory superannuation schemes in operation. The company is within six miles of the South Devon coast. Write, stating previous experience, age and salary required, to Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 5722

***Situations Vacant** (continued)*

ELECTRIC cable manufacturer requires energetic sales representative for South London and South-East England. Applicants should possess sound education, proved selling ability and preferably experience in the thermoplastic cable trade. Apply giving fullest details and salary required, in strict conndence to—Sales Manager, Permanoid Ltd., New Islington, Manchester, 4. 5716

ELECTRIC lamp manufacturer has vacancies for representatives in Lancashire and in the Midlands. Replies with full details of experience, age, salary required to—Box 9544.

ELECTRICAL engineer required for liaison between design department and works. Automatic control experience essential. Rotating machinery experience advantageous. Progressive position with expanding company situated thirty miles north of London. Housing assistance given after probationary period. All replies treated in strictest confidence and answered.—Box 5797.

ELECTRICAL insulation sales engineer required to represent old-established manufacturer of flexible insulants and laminated plastics in northern territory, paying occasional visits to the Midlands. A young man between 30 and 40, with good electrical engineering background, and knowledge of insulation problems and materials, could enjoy a progressive career. Remuneration by salary. Pension scheme. Car provided. Write full details of technical and commercial experience to—Box 5792.

ELECTRICAL insulation sales engineer required to take charge of section of sales department specialising in marketing flexible insulants and laminated plastics. A young man between 30 and 40, with good electrical engineering background, knowledge of applications for various types of insulation, and with personality and drive, could enjoy a satisfying and rewarding career with an old-established manufacturer. Salary commensurate with qualifications and experience; pension scheme.—Box 5791.

ELECTRICAL tester required. Must be experienced in the testing of rotating machines. Preference given to person with some technical training. Large variety of designs up to 20 kW. Good rate, plus bonuses. Canteen. Pension scheme. Apply in writing giving experience, age, etc., to—W. Mackie & Co. Ltd., 129/133, Lambeth Road, London, S.E.1. 5743

ENGINEER (20/25) to assist service/sales engineer required by leading Midland furnace manufacturing company for their London division. Applicants should have served a recognised electrical engineering apprenticeship, preferably with mechanical background. Details of qualifications and experience in the first instance to—Box 5654.

FOREMAN electrician required for contractors and retailers in Cambs. district. Must have thorough knowledge of trade, ability to organise and control labour. Age not over 35. Write giving full details, salary expected and current references to—Box 9560.

H. J. CASH & Co. Ltd. require in London an estimating and supervising engineer for all types of electrical installation contracts. Only men experienced in taking off quantities for lump sum and schedule prices should apply. The position is permanent, pensionable and offers prospects. Write giving previous experience and salary recently earned to — Caxton House, Tothill Street, London, S.W.1. 407

H.T. 11-kV cable jointers required for United Kingdom and the Middle East. Must be thoroughly experienced in all types of cable jointing. Please reply giving personal details, experience, past employers, etc., to—Box 5753.

INSURANCE company invites applications from electrical engineers for an appointment as engineer surveyor in the Birmingham area. Applicants should have served an apprenticeship with an electrical manufacturer and hold a Higher National Certificate, with a sound knowledge of all classes of electrical equipment and repairs. Age 25/35. Progressive salary scale, commencing £735 rising to £1.060 per annum, plus other expenses and allowances. Non-contributory pension scheme. Apply in own handwriting to—Box 5793.

INTERESTING position open with an important cinema organisation for a young enthusiastic engineer with practical electronic experience in a new and expanding field in the cinema industry. Must be prepared to travel within the British Isles. State age, education, training, experience and salary required to—Box 5794.

NATIONAL building and civil engineering contractors invite applications from qualified electrical engineers (A.M.I.E.E.), age 35/40. Applicants should have sound practical experience in preparing schemes and estimates for temporary works and permanent installations on building and civil engineering works, and in the supervision of works on sites and in workshops. The selected applicant will be eligible for bonus and superannuation schemes after probationary period. Apply in confidence giving details of qualifications and experience and salary required to Personnel Manager.— Box 5750.

PERSONAL assistant to manager required. Applicant to have sound practical and technical knowledge as applied to construction and winding of heavy industrial electrical machines. Reply in confidence, giving age, qualifications and general experience. — Dynamo & Motor Repairs Ltd., Belgrave Terrace, Handsworth, Birmingham, 21. 5734

PUBLICITY. Applications are invited from men capable of handling the publicity of a firm manufacturing switchgear and transformers. Publicity experience essential, and preferably some electrical engineering training. Offices situated in Wilmslow (14 miles south of Manchester). Replies, which will be treated in confidence, to Branch Manager, South Wales Switchgear Ltd., Rex Buildings, Wilmslow, Cheshire. 5665

REPRESENTATIVES, experienced, car owners, selling decorative and commercial lighting fittings to the trade, stores and wholesalers. Good salary, commission and expenses. Areas: (1) London and S. Suburbs; (2) West of England; (3) N. and S. Wales; (4) Scotland; (5) The 4 Northern Counties. Write with full particulars to—Box 5562.

SALES engineers required to join inside staff of a young progressive sales organisation. Applicant must have a sound knowledge of sales estimating procedure and circuitry in contactor type motor control gear. Good salary, profits bonus, life assurance and pension provisions. First-class working conditions, canteen facilities, five-day week. Apply own handwriting giving full details experience and positions held with salaries to date.—M.T.E. Control Gear Ltd., Leigh-on-Sea, Essex. 5745

SALES representative with connection in South-East Lancashire (excluding Manchester). Excellent opportunity for live man. Salary, commission, expenses, pension scheme. Full details in confidence to—Branch Manager, Sloan Electrical Co. Ltd., 28/32, Queen Street, Manchester, 2. 5746

SENIOR contracts engineer required by London contractor. Experienced in general electrical contracting, cabling, switchgear and plant installation. Pension scheme. Permanent. Prospects. Particulars in confidence to—Box 5657

STORES superintendent wanted; must be capable of ordering, costing, etc., all materials required by electrical installation and maintenance department of large factory in Central London.—Box 9574.

SUPERVISING electrical engineer required for S.W. London electrical contractors. Duties to include supervision of contracts, estimating, preparation of schemes (including underfloor heating) for council, private and industrial works. Replies, which will be treated in the strictest confidence, giving fullest particulars of age, experience and salary required, to Box 5715. All applications will be acknowledged.

SUPERVISING engineer required by electrical contracting co. for service in East Africa. Experience in preparing specifications, estimating and control of labour essential. Please write giving details of age, education and experience to—Marrvat's, East Africa, 40, Hatton Garden, London, E.C.1. 5708

TRANSFORMER designer required by young progressive company. All types up to 500 kVA.—Twickenham Transformers Limited, 301, Richmond Road, Twickenham (POPesgrove 0141). 9572

TRUNK telephone cable plumber-jointers required.—Box 5668.

VACANCIES occur in a consulting engineer's office for junior and senior draughtsmen with experience in lighting and power installations in buildings. The posts offer opportunity for gaining experience in mechanical services also and are progressive. Good drawing and printing essential. Five-day week, usual holidays. Apply in writing stating age, training and experience to C. MacKechnie Jarvis and Partners, 34, Victoria Street, London, S.W.1. 5710

WANTED on three-year contract for British concern in India, an experienced mechanical maintenance engineer to supervise turbine overhauls and ancillary equipment. Experience of Parsons turbines desirable. Excellent terms with tax-free salary and free furnished quarters, car and medical attention.—Box 5795.

YOUNG heating engineer required for preparing floor warming schemes. Apply in writing to Personnel Manager, Simplex Electric Company Ltd., Grindley Lane, Blythe Bridge, Stoke-on-Trent, N. Staffs, giving full details of experience. 5669

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A GRAD.I.E.E. (27), B.T.H. app., experienced design, maintenance, development, research, customer liaison and correspondence; now development high-power silicon rectifier equpts.; fluent French, Italian; travelled extensively Europe, Africa; pleasant personality; studying Inst. of Management; ambitious, therefore seeks position of responsibility, with genuine prospects and initiative encouraged. Technical, admin., tech./commercial. £1,200 p.a. (less if car provided).—Box 9557.

A.M.I.E.E. seeks executive posn. Extensive experience switchgear design manufr. oil air break air blast outdoor and metalclad. High low volt cartridge fuses.—Box 9567.

ASSISTANT manager with leading E.W.F. wholesalers seeks new appointment, personal reasons; 30 years' experience all aspects trade; now responsible for entire internal administration of present firm. Possesses drive and initiative.—Box 9562.

CABLE jointer (31), experienced all types up to 132 kV, supervisory preferred. Able driver. Willing to travel.—Box 9564.

COMMERCIAL executive, university graduate, A.M.I.E.E. (47), steam power station and all-round engineering sales experience, fluent German and French, some Spanish, desires change.—Box 9575.

ELECTRICAL/mechanical engineer, erection and running of diesel power stations, H.T. and L.T. distribution, all types of internal wiring and domestic apparatus, installation and maintenance of air conditioning and refrigerating plant, maintenance of mechanical plant, fixed and mobile, fifteen years' experience in the Middle East, desires post at home or abroad. —Box 9553.

EXPERIENCED elect. engr. seeks London post. Interesting work more important than high salary.—Box 9576.

SALES engineer, A.M.I.E.E., age 39 years, seeks position in sales organisation Southern England. Extensive knowledge motors, control gear, generators, transfofmers, H.V. and L.V. switchgear, instruments, meters, etc. Twelve years' sales experience, home and export. Good organiser.—Box 9568.

SALES executive, A.M.I.E.E., requires position with electrical wholesaler or small or medium size manufacturer as sales manager. Thorough knowledge most types of electrical equipment and excellent organising ability. Southern area preferred.—Box 9570.

SALES representative, A.M.I.E.E., experienced in dealing with customers at all levels, wants change to South or South-West England.—Box 9560.

SALES representative (46), M.A.S.E.E., seeks change, London and Home Counties.—Box 9573.

SENIOR appointment required by sales engineer. Widely connected and experienced. London or Home Counties.—Box 9563.

ARTICLES FOR SALE

STOVING OVENS

TWO ROYCE Electrically Heated Stoving Ovens, 400/230v./1/50, air circulating fan, temperature instruments, effective size of ovens 70" wide, 54" high, 52" long, double doors, new.

RICHARD WILSON
Bradford Road, Stanningley, Pudsey, Yorks.
(Tel. Pudsey 4291/2)

5747

WARD LEONARD SETS

each with motor generator set incorporating separately excited generator, direct coupled to driving motor wound for 400/440 volts, 3-phase, 50 cycles, with control gear.

Work motor details :—

0/370 h.p., BRUCE PEEBLES, 0/220 v., 0/1500 r.p.m., drip-proof.
0/225/225 h.p., HARLAND, 0/250 v., 0/1450/1750 r.p.m., vertical.
0/200/200 h.p., G.E.C., 0/220 v., 0/750/1000 r.p.m., enc. ventilated.
0/195/195 h.p., HARLAND, 0/220 v., 0/1100/1750 r.p.m., drip-proof.
0/150 h.p., MET. VICK., 0/500 v., 0/1500 r.p.m., drip-proof.
0/150/150 h.p., L.S.E., 0/500 v., 0/700/1600 r.p.m., screen protected.
0/120 h.p., G.E.C., 0/220 v., 0/960 r.p.m., screen protected.
0/100/100 h.p., L.D.C., 0/220 v., 0/750/960 r.p.m., screen protected.
0/73/73 h.p., HARLAND, 0/480 v., 0/1250/1550 r.p.m., drip-proof.
0/35/35 h.p., B.T.H., 0/480 v., 0/1250/2000 r.p.m., screen protected.
0/33/33 h.p., MAWDSLEY, 0/250 v., 0/1000/1350, drip-proof.
1.67/16.5 h.p., B.T.H., 90/250 v., 480/2160 r.p.m., totally enclosed.

A number of smaller units also available.

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5 - 1.7	L.S.E.	2250 - 750
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307

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10-kVA/10-h.p. D.C. and A.C. School or Laboratory Test Set. Output 25 to 60 cycles and 150/500 volts D.C.
Reconditioned Motors.
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VARIABLE SPEED MOTORS

500 volts D.C., with Control Gear

One	60	h.p.	480/1450 r.p.m.
One	45	"	850/1430 "
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One	30	"	500/1500 "
Twelve	25	"	850/1420 "

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HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

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PLATING MOTOR GENERATOR SETS FOR SALE

ITEM 1. Output 12 volts, 2,500 amps. D.C., separately excited, 45-h.p., 960-r.p.m. squirrel cage motor, 415 volts, 3-phase, 50 cycles.

ITEM 2. Output 12 volts, 7,000 amps. D.C., comprising two generators each 3,500 amps., with central motor, 150-h.p., 970-r.p.m. slipring type, 415 volts, 3-phase, 50 cycles.

ITEM 3. Output 20 volts, 5,000 amps. D.C., motor 180-h.p., 735-r.p.m. slipring type, 440 volts, 3-phase, 50 cycles.

ITEM 4. Output 15 volts, 2,000 amps. D.C., motor 52-h.p., 720-r.p.m. slipring type, 415 volts, 3-phase, 50 cycles.

All sets are separately excited and complete with Starters, Regulators and Meters.

Inspection by arrangement, North-West London.

Enquiries to—Box 5680.

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AVAILABLE immediately, one ALLEN WEST 11,000-volt, 250-MVA, metalclad, spring operated switchboard, comprising five indoor, vertical, isolation, draw-out types oil circuit breakers, varying from 400-800 amperes.

Available April/May, 1959, three ALLEN WEST 11,000-volt, 250-MVA, metalclad, solenoid operated switchboards, comprising respectively 5, 6 and 5 indoor, vertical isolation, draw-out type oil circuit breakers, varying from 400-1,200 amperes.

For further particulars please apply:

THE STEEL COMPANY OF WALES LIMITED,
Sundry Sales Section
Abbey Temporary Offices
Port Talbot, Glam.

5796

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

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Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS. Three 100-kVA, 400-v., 3-phase, 4-wire, 50-cycle Houchin/General Motors direct-coupled diesel sets, with switchboards, batteries, starters, etc. As new, can be seen running in London.—Box 5647.

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CABLE, underground, all types ex stock.—E. M. Tatton Co., Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

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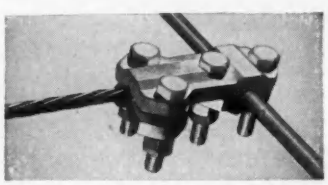

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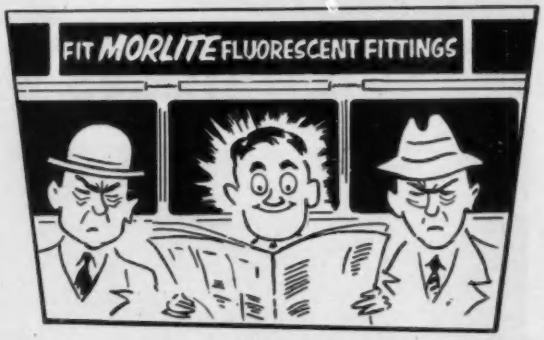

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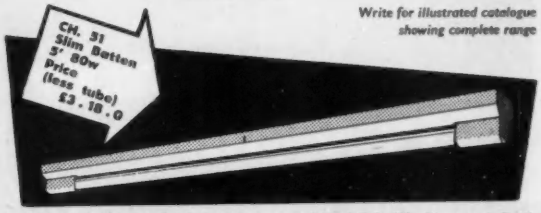

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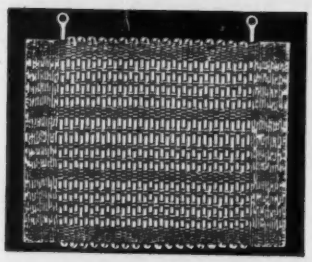

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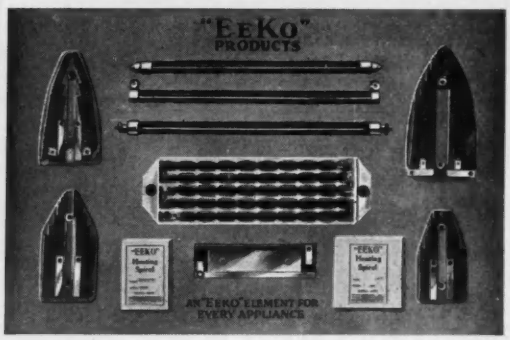

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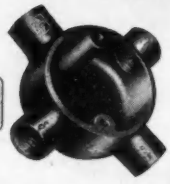

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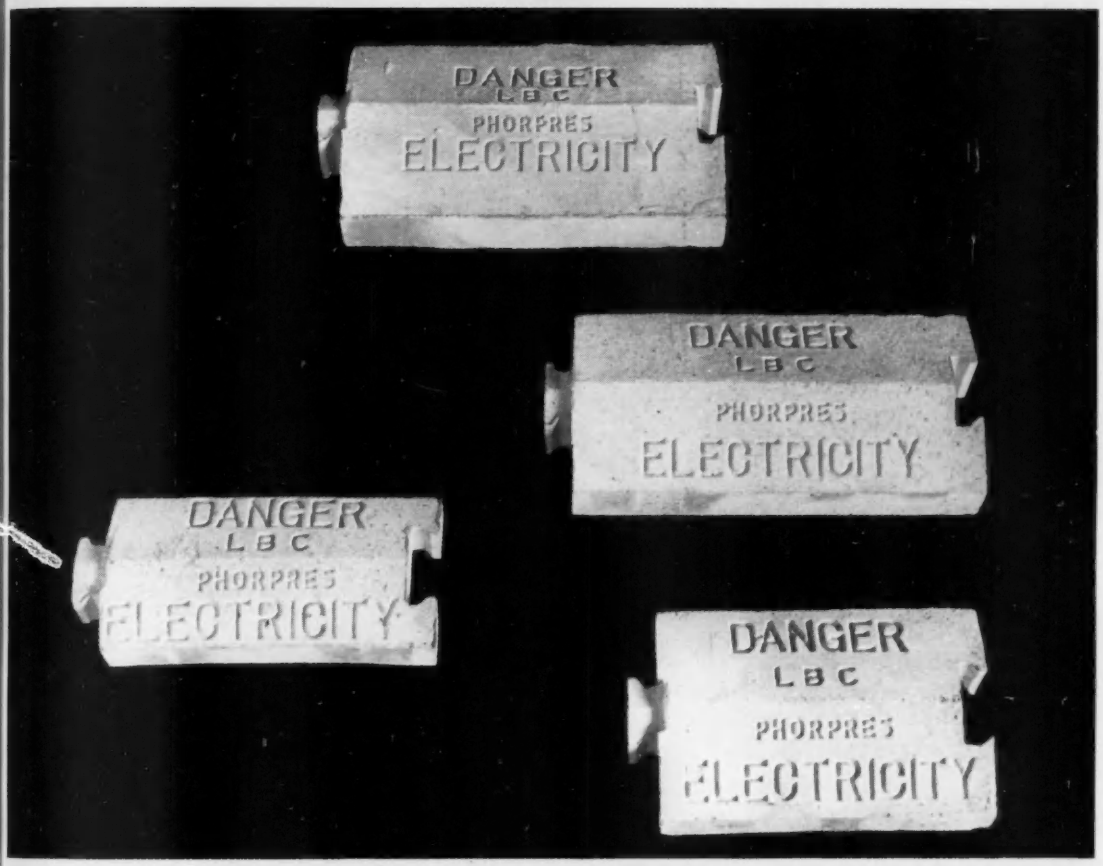

CABLE COVERS

A range of "Phorpres" Earthenware Cable Covers to B.S.S. 2484 manufactured by London Brick Company Limited. These Cable Covers are now obtainable from Transformers (Watford) Limited (a Subsidiary of London Brick Company) to whom all enquiries should be addressed.

TRANSFORMERS (WATFORD) LIMITED

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BRENTFORD for Voltage Regulatio

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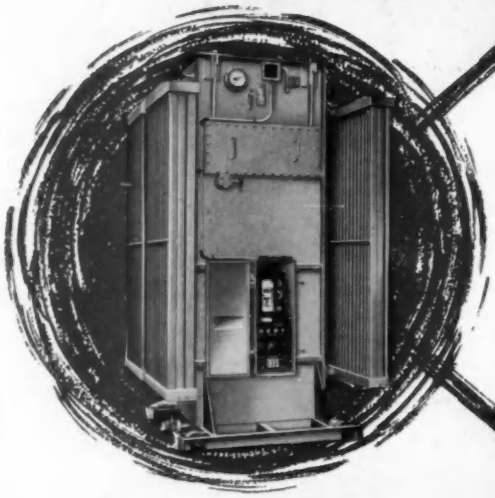
serve Atomic Power

Brentford Regulators are used at Harwell as part of the rectifier installation in the Zeta Power Plant, and are thus contributing to the initial researches into the controlled release of thermo-nuclear energy. We are also supplying regulators for use in the various Atomic Power Stations under construction.

Photograph of Zeta discharge tube assembled with transformer.



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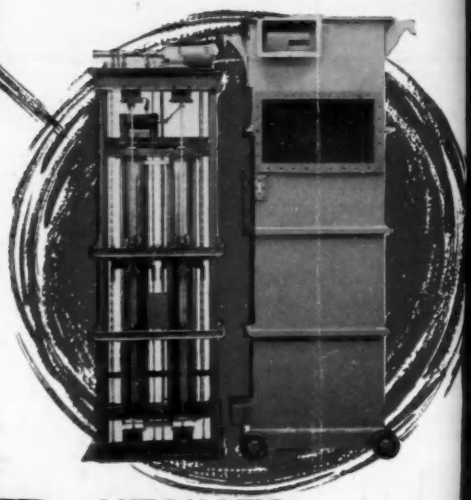
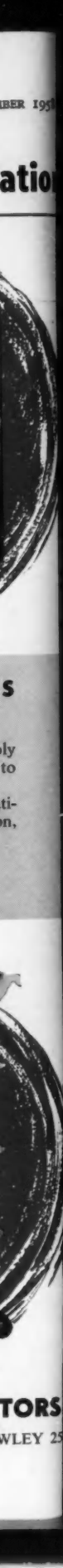


BRENTFORD AUTOMATIC VOLTAGE REGULATORS

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